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Development Document for Effluent Limitations Guidelines New Source Performance Standards and Pretreatment Standards for the Iron and Steel Manufacturing Point Source Category. Volume VI. Cold Forming Subcategory Alkaline Cleaning Subcategory Hot Coating Subcategory

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Final

Iron and Steel Manufacturing

Point Source Category

Volume VI

Cold Forming Subcategory
Alkaline Cleaning Subcategory
Hot Coating Subcategory

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Volume VI of six volume set which presents data rationale and technical aspects of the final effluent limitations and standards for the iron and steel industry published in the Federal Register on May 27, 1982 (47 FR 23258-317). Volume VI describes the general methodology and issues whereas the remaining volumes contain specific subcategory reports. Volume VI pertains to the Cold Forming, Alkaline Cleaning and Hot Coating subcategories.

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NEW SOURCE PERFORMANCE STANDARDS
and
PRETREATMENT STANDARDS
for the
IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY

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COLD FORMING SUBCATEGORY

COLD ROLLING

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COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION I

PREFACE

The USEPA has promulgated effluent limitations and standards for the steel industry pursuant to Sections 301, 304, 306, 307, and 501 of the Clean Water Act. The regulation contains effluent limitations for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS).

This part of the Development Document highlights the technical aspects of EPA's study of the Cold Rolling Subdivision of the Cold Forming Subcategory of the Iron and Steel Industry. Volume I of the Development Document addresses general issues pertaining to the industry, while other volumes contain specific subcategory reports.

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION II

CONCLUSIONS

Based upon this current study, a review of previous studies and comments received on the regulation proposed on January 7, 1981 (46 FR 1858), the Agency has reached the following conclusions with respect to the cold rolling subdivision of the cold forming subcategory.

1. Cold rolling and cold worked pipe and tube operations have been combined into one subcategory called "Cold Forming." Because of differences in process operations and wastewater treatment and disposal practices, the two operations are reviewed separately. This report addresses cold rolling operations.

2. The Agency is retaining the previous segmentation for cold rolling operations, but has established subsegments for single stand recirculation and direct application mills. Limitations and standards have been developed separately for single and multiple stand recirculation mills, combination mills, and single and multiple stand direct application mills because of differences in flow rates. The segmentation of the cold rolling subdivision of the cold forming subcategory is as follows:

   Cold Rolling Operations
   - Recirculation Mills
     - Single Stand
     - Multi-stand
   - Combination Mills
   - Direct Application Mills
     - Single Stand
     - Multi-Stand

3. The Agency has promulgated BPT limitations for the cold rolling subdivision which are different than those previously promulgated in 1976. However, the promulgated limitations are based upon the same model treatment technology (dissolved gas flotation). These changes were made to more accurately reflect data obtained from the industry and through sampling conducted by the Agency since the original study.

4. In addition to establishing separate subsegments for single stand mills, the Agency has changed the BPT model treatment system flows for combination mills (from 400 gal/ton to 300 gal/ton) and direct application multiple stand mills (from 1000 gal/ton to 400 gal/ton). The model flows for single stand mills have been established at 5 gal/ton for recirculation mills, and 90 gal/ton

for direct application mills. The model flows for multiple stand recirculation mills remain the same at 25 gal/ton.

5. Sampling of raw and waste oil solutions, raw wastewater, and treated and partially treated wastewaters from cold rolling operations demonstrated that the presence of toxic organic compounds in the wastewaters is pervasive and highly variable. The presence of toxic organic pollutants is attributable to the oil and cleaning solutions used at cold rolling operations. The Agency concluded that it should establish limitations for toxic organic pollutants for all cold rolling operations.

6. The Agency has promulgated BPT limitations for toxic and conventional pollutants. The toxic pollutants for which limitations have been established are naphthalene and tetrachloroethylene (for all operations); lead and zinc (for carbon steel operations); and chromium and nickel (for specialty steel operations). The 30-day average limitations for total suspended solids and oil and grease, and limitations for pH are based upon the same effluent quality as were the previously promulgated limitations. Dissolved iron is no longer being limited.

7. Because of the high variability in the occurrence of toxic organic pollutants in cold rolling wastewaters, the Agency has promulgated limitations and standards only for naphthalene and tetrachloroethylene which were found to be common to most rolling and cleaning solutions, respectively. The Agency recommends that limitations for other toxic organic pollutants be established on a case-by-case basis for the particular mix of rolling and cleaning solutions in use at a given plant. Because of the complex nature of the cold rolling process, the Agency has concluded that it is not possible to limit toxic organic pollutants at cold rolling operations by specifying the use of "clean" rolling or cleaning solutions.

8. The Agency has promulgated BAT limitations for toxic pollutants which are the same as the respective BPT limitations.

9. The Agency has promulgated BCT limitations which are the same as the BPT limitations for conventional pollutants.

10. EPA estimates that compliance with the BPT, BCT and BAT limitations and PSES will result in significant removals of toxic and conventional pollutants. A summary of the discharges are shown below.

Direct Discharges
Effluent Loadings (Tons/Year)

	Raw Waste	BPT/BCT/BAT
Flow, MGD	29.6	28.1
TSS	22,502	653
Oil and Grease	86,942	286
Toxic Metals	94	21
Toxic Organics	337	4.1

Indirect Discharges
Effluent Loadings (Tons/Year)

	Raw Waste	PSES
Flow, MGD	0.2	0.2
TSS	275	4.4
Oil and Grease	3,986	1.9
Toxic Metals	5.4	0.3
Toxic Organics	2.1	0.2

11. The Agency estimates that the industry will incur the following costs in complying with the limitations and standards for cold rolling operations. The Agency has determined that the effluent reduction benefits associated with compliance with these limitations and standards justify the costs presented below:

Costs (Millions of July 1, 1978 Dollars)

	Investment Costs		Annual Costs	
	In-Place	Required	In-Place	Required
BPT	22.6	5.1	2.8	0.8
BAT	0.0	0.0	0.0	0.0
PSES	0.004	0.058	0.0006	0.007

The Agency has also determined that the effluent reduction benefits associated with compliance with new source standards (NSPS, PSNS) justify these costs.

12. Although the Agency believes that most new source cold rolling operations will be recirculation mills, the Agency has established NSPS for the recirculation, combination and direct application segments of the cold rolling subdivision. The NSPS model discharge flows are based upon best demonstrated flows in each segment and the same effluent quality used to develop the BPT and BAT limitations. The Agency believes that compliance with these standards will not preclude production of any cold rolled products at new source mills.

13. The Agency has promulgated pretreatment standards for new and existing sources (PSNS and PSES) discharging to POTWs. The standards are the same as the respective BPT limitations. These standards limit the discharge of toxic metal and toxic organic

pollutants and are intended to minimize the pass through of those pollutants at POTW operations.

14. With regard to the "remand issues," the Agency has concluded that:

    a. Less stringent effluent limitations are not appropriate for older cold rolling operations. The age of a cold rolling mill has no significant effect upon the ease or cost of retrofitting pollution control equipment.

    b. The alternative treatment systems considered for cold rolling operations do not include cooling or recycle systems. Hence, there is no consumptive water usage.

15. Table II-1 presents the BPT effluent limitations, treatment model flows and effluent quality data used to develop the effluent limitations for the cold rolling subdivision. The BAT and BCT effluent limitations are the same as the BPT limitations. Table II-2 presents the NSPS, PSES, and PSNS treatment model flow and effluent quality data used to develop the standards. Table II-3 presents the standards for NSPS, PSES and PSNS.

TABLE II-1

BPT/BCT EFFLUENT LIMITATIONS GUIDELINES
COLD FORMING SUBCATEGORY - COLD ROLLING

		Concen-tion (mg/l) All Cold Rolling	Effluent Limitations (kg/kkg)				
			Recirculation			Direct Application	
			Single Stand	Multi Stand	Combination	Single Stand	Multi Stand
Discharge Flow (gal/ton)			5	25	300	90	400
TSS	Avg	30	0.000626	0.00313	0.0375	0.0113	0.0501
	Max	60	0.00125	0.00626	0.0751	0.0225	0.100
O & G	Avg	10	0.000209	0.00104	0.0125	0.00375	0.0167
	Max	25	0.000522	0.00261	0.0313	0.00939	0.0417
Chromium(1)	Avg	0.4	0.0000083	0.0000417	0.000501	0.000150	0.000668
	Max	1.0	0.0000209	0.000104	0.00125	0.000375	0.00167
Lead	Avg	0.15	0.0000031	0.0000156	0.000188	0.0000563	0.000250
	Max	0.45	0.0000094	0.0000469	0.000563	0.000169	0.000751
Nickel(1)	Avg	0.3	0.0000063	0.0000313	0.000375	0.000113	0.000501
	Max	0.9	0.0000188	0.0000939	0.00113	0.000338	0.00150
Zinc	Avg	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max	0.3	0.0000063	0.0000313	0.000375	0.000113	0.000501
Naphthalene	Avg	-	-	-	-	-	-
	Max	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
Tetrachloro-ethylene	Avg	-	-	-	-	-	-
	Max	0.15	0.0000031	0.0000156	0.000188	0.0000563	0.000250

Note: pH is also regulated at BPT and is limited to 6.0 to 9.0 standard units for all cold rolling operations.

(1) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

TABLE II-2

TREATMENT MODEL FLOWS AND EFFLUENT QUALITY COLD FORMING SUBCATEGORY - COLD ROLLING

	Flowrates (gal/ton)			
	BAT	**NSPS**	**PSES**	**PSNS**
1. Recirculation				
a. Single stand	5	5	5	5
b. Multi stand	25	10	25	10
2. Combination	300	130	300	130
3. Direct Application				
a. Single stand	90	25	90	25
b. Multi stand	400	290	400	290

30-Day Average and Daily Maximum Concentrations

	BAT		NSPS		PSES		PSNS	
Pollutant	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX
TSS	-	-	30	60	-	-	-	-
O & G	-	-	10	25	-	-	-	-
119 Chromium(1)	0.4	0.4	1.0	0.4	1.0	0.4	1.0	
122 Lead	0.15	0.45	0.15	0.45	0.15	0.45	0.15	0.45
124 Nickel(1)	0.3	0.9	0.3	0.9	0.3	0.9	0.3	0.9
128 Zinc	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
55 Napthalene	-	0.1	-	0.1	-	0.1	-	0.1
85 Tetrachloroethylene	-	0.15	-	0.15	-	0.15	-	0.15

Note: Concentrations apply to all cold rolling operations and are expressed in mg/l unless otherwise noted. pH is also regulated at BCT and NSPS and is limited to 6.0 to 9.0 standard units for all cold rolling operations.

(1) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

TABLE II-3

EFFLUENT LIMITATIONS AND STANDARDS
COLD FORMING SUBCATEGORY - COLD ROLLING

	Effluent Limitations and Standards (kg/kkg of Product) (1)							
	BAT		NSPS		PSES		PSNS	
Pollutants	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX
1. Recirculation a. Single stand								
TSS	-	-	62.6	125	-	-	-	-
O & G	-	-	20.9	52.2	-	-	-	-
119 Chromium(2)	0.83	2.09	0.83	2.09	0.83	2.09	0.83	2.09
122 Lead	0.31	0.94	0.31	0.94	0.31	0.94	0.31	0.94
124 Nickel(2)	0.63	1.88	0.63	1.88	0.63	1.88	0.63	1.88
128 Zinc	0.21	0.63	0.21	0.63	0.21	0.63	0.21	0.63
55 Napthalene	-	0.21	-	0.21	-	0.21	-	0.21
85 Tetrachloroethylene	-	0.31	-	0.31	-	0.31	-	0.31
b. Multi Stand								
TSS	-	-	125	250	-	-	-	-
O & G	-	-	41.7	104	-	-	-	-
119 Chromium(2)	4.17	10.4	1.67	4.17	4.17	10.4	1.67	4.17
122 Lead	1.56	4.69	0.63	1.88	1.56	4.69	0.63	1.88
124 Nickel(2)	3.13	9.39	1.25	3.75	3.13	9.39	1.25	3.75
128 Zinc	1.04	3.13	0.42	1.25	1.04	3.13	0.42	1.25
55 Napthalene	-	1.04	-	0.42	-	1.04	-	0.42
85 Tetrachloroethylene	-	1.56	-	0.63	-	1.56	-	0.63
2. Combination								
TSS	-	-	1630	3250	-	-	-	-
O & G	-	-	542	1360	-	-	-	-
119 Chromium(2)	50.1	125	21.7	54.2	50.1	125	21.7	54.2
122 Lead	18.8	56.3	8.14	24.4	18.8	56.3	8.14	24.4
124 Nickel(2)	37.5	113	16.3	48.8	37.6	113	16.3	48.8
128 Zinc	12.5	37.5	5.42	16.3	12.5	37.5	5.42	16.3
55 Napthalene	-	12.5	-	5.42	-	12.5	-	5.42
85 Tetrachloroethylene	-	18.8	-	8.14	-	18.8	-	8.14

TABLE II-3
EFFLUENT LIMITATIONS AND STANDARDS
COLD FORMING SUBCATEGORY - COLD ROLLING
PAGE 2

	Effluent Limitations and Standards (kg/kkg of Product)(1)							
	BAT		NSPS		PSES		PSNS	
Pollutants	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX
3. Direct Application								
a. Single Stand								
TSS	-	-	313	626	-	-	-	-
O & G	-	-	104	261	-	-	-	-
119 Chromium(2)	15.0	37.5	4.17	10.4	15.0	37.5	4.17	10.4
122 Lead	5.63	16.9	1.56	4.69	5.63	16.9	1.56	4.69
124 Nickel(2)	11.3	33.8	3.13	9.39	11.3	33.8	3.13	9.39
128 Zinc	3.75	11.3	1.04	3.13	3.75	11.3	1.04	3.13
55 Napthalene	-	3.75	-	1.04	-	3.75	-	1.04
85 Tetrachloroethylene	-	5.63	-	1.56	-	5.63	-	1.56
b. Multi Stand								
TSS	-	-	3630	7260	-	-	-	-
O & G	-	-	1210	3020	-	-	-	-
119 Chromium(2)	66.8	167	48.4	121	66.8	167	48.4	121
122 Lead	25.0	75.1	18.2	54.4	25.0	75.1	18.2	54.4
124 Nickel(2)	50.1	150	36.3	109	50.1	150	36.3	109
128 Zinc	16.7	50.1	12.1	36.3	16.7	50.1	12.1	36.3
55 Napthalene	-	16.7	-	12.1	-	16.7	-	12.1
85 Tetrachloroethylene	-	25.0	-	18.2	-	25.0	-	18.2

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(1) The limitations and standards have been multiplied by 10^5 to obtain the values presented in this table.

(2) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION III

INTRODUCTION

General Discussion

Cold rolling is the process in which flat unheated steel products are reduced in thickness by rolling operations. The rolling operation compresses the steel between rolls to reduce the thickness of the product while imparting desired physical, mechanical and surface properties. Oil solutions are applied directly to the rolls or product to dissipate the heat produced during rolling and to provide lubrication. Various oils and .oil application systems are used depending on the product being rolled and the properties desired in the steel. There are three types of oil application systems: (1) recirculation; (2) combination; and (3) direct application. The cold rolling subdivision has been segmented to recognize differences in these systems.

Due mainly to the use of the oil solutions, various pollutants are discharged at high levels from cold rolling mills. The two most common are oil and grease and total suspended solids. However, due to the nature of some of the oils used in the process, toxic metals and toxic organic pollutants are also present in cold rolling wastewaters at significant levels.

The Agency promulgated BPT limitations for cold rolling (CR) operations in 1976 for four pollutants: oil and grease, total suspended solids, dissolved iron, and pH. For this study, the Agency conducted additional sampling and gathered detailed information from the industry. This additional information indicates that these wastewaters are contaminated with varying levels of diverse toxic organic pollutants. The potential for high levels of toxic organic pollutants in the discharges from cold rolling operations is great. The Agency has, therefore, promulgated effluent limitations for two toxic organic pollutants common to most cold rolling wastewaters and recommends that limitations for other toxic organic pollutants be established on a case-by-case basis.

Data Collection Activities

Process information and wastewater quality data were obtained through sampling visits at 72 cold rolling operations at 24 plants. The Agency conducted eleven sampling visits during the original guidelines study and visited 64 operations during the recent toxic pollutant survey (3 plants were resampled). The plants which were sampled during the course of this study are listed in Table III-1. An intensive sampling program was conducted at one plant (0684F) to characterize the performance of the model wastewater treatment technology with respect to toxic organic pollutants.

One of the Agency's primary sources of information for the current study are industry responses to the DCP's that were sent to about 85% of the active cold rolling operations in the United States. Through these questionnaires, the Agency requested information on process and discharge flow rates, treatment systems in use, mill capacities and modes of operation. DCP responses were received for two hundred and twenty nine cold rolling mills. The data for these mills have been tabulated and are summarized in Tables III-2 to III-5. Table III-2 lists all the plants that have cold rolling mills and describes the number and type of the cold rolling mills at each site. Tables III-3 to III-5 provide more detailed information for individual mills. These tables have been separated by the type of oil application system.

Detailed Data Collection Portfolios (D-DCP's) were sent to thirty-one selected mills to gather long-term effluent quality data, cost data for treatment systems installed, and information on mill operations. The D-DCP responses provided data to verify Agency cost estimates, establish retrofit costs, and to provide additional effluent quality data. Tables III-6 through III-8 summarize the data base for cold rolling operations.

Limitations for Cold Rolling Operations

The original limitations for cold rolling operations were established separately by mill type (oil application system), and applied to each mill as a whole regardless of the number of rolling stands present at the mill. In response to industry comments the Agency reexamined and refined this segmentation.

The Agency first examined whether segmentation of the cold rolling subdivision by the type of oil application system was appropriate or whether all cold rolling mills could operate with recirculating oil systems (which would reduce the amount of pollutants discharged). The Agency analyzed all available data and contacted mill operators and designers. From this study, the Agency determined that not all cold rolling mills can make the modifications necessary to convert from either direct application or combination systems to recirculation systems. Some direct application and combination type mills can recirculate all oil solutions. Other mills with oil sumps located beneath the mills would require major capital investments and production disruptions to convert to recirculation systems. For this reason, the Agency has retained the original segmentation by mill type.

The Agency also considered establishing limitations for each mill stand to account for possible flow variations that can occur between cold rolling mills with different numbers of stands. The Agency tabulated all available data and compared both methods (limitations on a per mill basis vs. limitations on a per stand basis). The limitations developed by aggregating the single stand allowances were more stringent in some instances, and less stringent in others, than those limitations established on a mill basis. Therefore, the Agency has promulgated limitations on the same basis as the original regulation.

The Agency also investigated whether separate effluent limitations should be established for single and multiple stand mills within the recirculation and direct application segments. (There are no single stand operations at combination mills). The Agency found substantial differences in flow rates between single and multiple stand mills. As a result, the Agency has promulgated separate effluent limitations for these categories.

The Agency reevaluated the limitations for the four pollutants (i.e., total suspended solids, oil and grease, pH and dissolved iron) listed in the original regulation. The sampling conducted by the Agency has indicated widespread contamination of cold rolling wastewaters with toxic organic and metal pollutants. The Agency has, therefore, promulgated limitations for toxic pollutants at the BPT level and has eliminated the limitations for dissolved iron. These are discussed in detail in later sections of this report.

Description of Cold Rolling Operations

Cold rolling is that operation where unheated metal is passed through work rolls to reduce its thickness, to produce a smooth dense surface, and to develop controlled mechanical properties in the steel.

There are several types of cold rolling processes. Cold reduction is a special form of cold rolling in which the thickness of the product is reduced by relatively large amounts in each pass through the rolls. In the production of most cold rolled materials, the cold reduction process is used to reduce the thickness of the hot rolled product between 25% and 90%. After cleaning and annealing, a considerable amount of cold rolled product is tempered. In tempering, the thickness of the material is reduced a small amount to impart desired mechanical properties and surface characteristics.

Cold rolled strip, cold rolled sheet, and cold rolled flat bar are the principal cold reduced flat products. Carbon and alloy steels are rolled. Most products rolled are carbon steel in sheet form and are used as base material for such coated products as long terne sheets, galvanized sheets, aluminum coated sheets, tin-plate, or tin-free steel. Hot rolled coils called "breakdowns" are the raw material used in the cold rolling operation. Prior to rolling, the coils are descaled and pickled, usually in a continuous pickling operation.

There are several types of cold reduction mills which vary in design from single stand reversing mills to continuous mills with up to six stands in tandem (in series). In the single stand reversing mill, the product is rolled back and forth between the work rolls until the desired thickness and mechanical and surface characteristics are achieved. In the single stand nonreversing mill, the material makes a single pass through the rolls and is recoiled. If additional rolling is required, the coil is returned to the head of the mill and reworked. The single stand nonreversing mill is generally used in tempering operations.

Most cold reduced flat steel is rolled on continuous three, four, or five stand tandem mills. In these mills the material continually passes from stand to stand until the desired thickness is attained. Continuous rolling mills have been almost universally installed during the past fifteen years in new applications.

A typical modern cold rolling shop contains a continuous pickling operation (sulfuric or hydrochloric acid) to remove scale and rust from the hot rolled breakdown coil. As it leaves the pickler, the strip is oiled to prevent rusting and to act as a lubricant in the cold rolling mill. The coil is then fed into a continuous cold rolling mill that can contain up to six rolling stands in tandem. Each stand contributes to the reduction in thickness of the material; the first contributes the greatest reduction while the last stand acts as a straightening, finishing, and gauging roll. Unlike hot forming, no scale is formed during this operation. It should be pointed out that the limitations and standards apply only to the wastewaters generated in cold rolling operations, even though other processes may be integrated into a complete "cold mill" complex. Wastewaters from the other processes have been regulated separately.

During cold rolling, the steel becomes quite hard and unsuitable for most uses. As a result, the strip usually must be annealed to return its ductility and to effect other changes in mechanical properties. This is done in either a batch or continuous annealing operation.

In batch or box annealing, a large stationary mass of steel is subjected to a long heat treating cycle and allowed to cool slowly. In continuous annealing, a single strip of cold reduced product passes through a furnace in a relatively short period of time. The heat treating and cooling cycle in the furnace is determined by the temperature gradient within the furnace as well as the dimensions and rate of travel of the steel. To prevent oxidation and the formation of scale, inert atmospheres are maintained in these furnaces at all times. Prior to annealing, the material must be cleaned of all dirt and oil from the pickling operation to prevent surface blemishes. In the case of the continuous annealing furnaces, the material is uncoiled and is passed through a continuous cleaning operation prior to entering the furnace. Upon leaving the furnace, the material is oiled, recoiled, and is ready to be tempered.

The temper mill is a single stand cold rolling mill designed to produce a slight reduction in thickness of the steel. This reduction develops the proper stiffness or temper by cold working the steel at a controlled rate. The end use of the material dictates the degree of tempering to be performed.

An oil-water emulsion is sprayed on the material before it enters the rolls at each stand of a cold rolling mill and the material is coated with oil prior to recoiling. This oil prevents rust while the material is in transit or storage and is removed before further processing or coating.

As mentioned earlier, there are three types of oil application systems used at cold rolling mills. The diagrams of these systems are shown in Figures III-1 through III-3. Additional details on the cold rolling operation and the three application systems are presented later in this report.

TABLE III-1

COLD ROLLING OPERATIONS SAMPLED

	Sampling Code(1)	Plant Code(2)	Type of Steel
A. Recirculation Mills			
	D	248B (01)	Specialty
	I	432K	Specialty
	P	156B	Specialty
	X-2	060B (03)	Carbon
	BB-2	060 (03)	Carbon
	EE-2,	112D (01)	Carbon
	FF-2(3)	384A	Carbon
	XX-2	684I (01)	Carbon
	101	020B (01,02, 04,05), 020C (01-08)	Specialty
	102	384A (02&03)	Carbon
	105	584F (02,03&05)	Carbon
	301	020B (01,02, 04,05) 020C (01-08)	Specialty
	302	060E	Specialty
	304A	0176 (08)	Specialty
	305B	176 (08)	Specialty
	306	248B (03)	Specialty
	307	248B (03)	Specialty
	308	320 (02)	Carbon
	310	432C (01)	Carbon
	315A & B	684 (02&03)	Carbon
	316	684B (01)	Carbon
	318	856P (01-21)	Carbon
	321 A,B & C	684D (01,02,04)	Specialty
B. Direct Application			
	VV-2(4)	584F (04)	Carbon
	105	584F (04)	Carbon
	106	112B (01,03-06)	Carbon
	304B	176 (02)	Specialty
	305A	176 (02)	Specialty
	313B	584A	Carbon
C. Combination			
	DD-2	584E (01)	Carbon
	YY-2(5)	432D (01)	Carbon
	311	432D (01)	Carbon
	312A & B	948C (04,02)	Carbon
	313A	584A (02)	Carbon
	319	856F (01)	Carbon
	320A	860B (03)	Carbon

TABLE III-1
COLD ROLLING OPERATIONS SAMPLED
PAGE 2

(1) The sampling code is an alphabetic or numeric code assigned at the time of sampling.
(2) The plant code is a reference code designated for each mill responding to the basic questionaire. For example, 060B (03) represents the third cold rolling mill at plant 060B.
(3) Plant FF-2 was resampled as Plant 102 during the Toxic Pollutant Survey. Since the analytical data collected during the survey is more recent and comprehensive, it is used to characterize the plant rather than the data for Plant FF-2.
(4) Plant VV-2 was resampled as Plant 105 during the Toxic Pollutant Survey. Since the analytical data collected during this survey is more recent and comprehensive, it is used to characterize the plant rather than the data for Plant VV-2.
(5) Plant YY-2 was resampled as Plant 311 during the Toxic Pollutant Survey. Since the analytical data collected during this survey is more recent and comprehensive, it is used to characterize the plant rather than the data for Plant YY-2.

TABLE III-2

DESCRIPTION OF U. S. COLD ROLLING MILLS

Plant Code	Number of Mills	Type of Rolling Mill					Type of Steel Rolled		Type of Product Rolled(1)								
		Recirculation	Direct Application	Combination	Dry	Unknown	Carbon	Specialty	A	B	C	D	E	F	G	H	I
020B	5	3	1			1		5			2	1	2				
020C	9	9						9	3		6						
020L	1	1						1		1							
060	8	3	5				8		7	1							
060B	3	1	1		1		3		3								
060D	8	6	1			1	1	7	8								
060E	1	1						1	1								
060I	2	2						2						2			
112A	12	1	6		5		12		4	8							
112B	6		6				6		6								
112D	2	1			1		2			1					1		
176	11	7	4					11	11								
248B	6	5				1		6	5		1						
248C	2	2						2									2
256A	2	2					2		2								
256B	1	1					1		1								
256L	1				1			1	1								
256N	24		24					24								24	
256O	5	5						5	5								
284A	4	1	1			2		4	2				2				
320	2	1	1				2		2								
384A	4	2	1		1		4		4								
396D	4	4					4		4								
396E	1	1					1		1								
432A	2	2					2		2								
432B	1	1					1		1								
432C	1	1					1			1							
432D	1			1			1		1								
448A	3	1		2			3			3							
528	5	3			2			5	5								
528B	1	1					1		1								
580C	5	5					5		3					2			
584A	2		1	1			2		1								
584E	5	1	1	2	1		5			5							
584C	1		1				1		1								
584F	6	4	2				6		6								

TABLE III-2
DESCRIPTION OF U. S. COLD ROLLING MILLS
PAGE 2

Plant Code	Number of Mills	Type of Rolling Mill					Type of Steel Rolled		Type of Product Rolled(1)								
		Recir-culation	Direct Application	Combi-nation	Dry	Unknown	Carbon	Specialty	A	B	C	D	E	F	G	H	I
648	3	3					3		1					2			
684B	1	1					1			1							
684C	2		2				2		1	1							
684D	7	7						7	7								
684F	3	2	1				3			3							
684I	2	1	1				2		2								
700	14	8			6		14		14								
724A	2	2					2			2							
760	7	7					7		7								
792C	3	3					3		3								
792B	3	3					3		3								
856D	4			3		1	4		4								
856E	1	1						1	1								
856F	3		1	2			3		3								
856P	21	21					21		21								
860B	4	2	1	1			4		4								
864B	3	3					3		3								
868A	3			3			3		3								
920A	1		1				1		1								
920C	1			1			1		1								
920G	2		2				2		2								
948A	2		2				2		2								
948C	4	1		3			4		4								
TOTAL	253	143	67	19	18	6	162	91	177	29	9	3	2	6	1	24	2
% of Total	100%	56.9%	26.6%	7.5%	6.7%	2.3%	64%	36%	70%	11.5%	3.6%	1.0%	0.8%	2.4%	0.4%	9.5%	0.8%

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(1) Product rolled is identified as follows:

A: Strip
B: Sheet
C: Strip, Sheet
D: Sheet, Plate
E: Strip, Sheet, Plate
F: Wire
G: Sheet, Tin Plate
H: Bar
I: Other

TABLE III-3

GENERAL SUMMARY TABLE
COLD ROLLING - RECIRCULATION

Plant Code	Age(1)	Capacity,(2) tpd	Number of Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each		
								Direct	POTW	Wastes Hauled
020B-02	1954	969	4	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020B-03	1957	60	1	Unk	Unk	No	H	0	0	Unk
020B-05	1952	306	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-03	1951	75	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-04	1951	81	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-05	1939	45	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-06	1941	39	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-07	1946	576	4	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-08	1950	129	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-09	1967	843	3	Unk	Unk	No	H	0	0	Unk
020C-02	1941	96	1	Unk	(5)	No	Ultra filtration	0	(5)	0
020C-01	1935	93	1	Unk	(5)	No	Ultra filtration	0	(5)	0
020L-01	1966	186	1	Unk	Unk	No	Unk	0	0	Unk
060-01	1936	2,658	3	543	0.4	Yes	EB,FLP,SS,CL,NL,A,VF	0.4	0	0
060-02	1941	1,974	4	1,168	0.9	Yes	EB,FLP,SS,CL,NL,A,VF	0.9	0	0
060-03	1970	4,803	5	2,889	0.8	Yes	DN,EB,T,FLP,F,P,NL,CL,SL,SS,VF	0.8	0	0
060B-03	1967	2,679	5	Unk	[17.7]	Yes	EB,GF,CL,SS	[17.7]	0	0
060D-02	1929(1961)	402	1	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-05	1947(1966)	153	1	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-06	1960	282	1	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-08	1960	984	4	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-04	1942(1960)	204	1	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-07	1960	471	1	Unk	Unk	Unk	NL,SL,SS,A	Unk	Unk	0
060E	1972	0	1	Unk	[0.05]	Unk	Unk	Unk	Unk	[0.05]
060I-01	1942	10.8	1	Unk	Unk	No	H	0	0	Unk
060I-02	1966	6	3	Unk	Unk	No	H	0	0	Unk
112A-07	1970	816	1	2,647	3.5	Yes	SS,SCR,NL,A,CY,SL,FLP,FLA	3.5	0	0
112D-01	1965	4,107	5	Unk	17.5	Yes	CR,FLP,NL,NW,CL,SL,SS	17.5	0	0
176-05	1946	63	1	1,756	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-06	1953	102	1	1,061	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-07	1962	126	1	1,415	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-08	1963	132	1	[900]	[0.27]	Yes	EB,FLP,CL,T,CY	[0.27]	0	0
176-09	1968	39	1	3,375	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-10	1971	4.5	3	776	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-11	1976	60	1	2,970	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
248B-01	NA	NA	1	[58]	[57]	Yes	Scr,EB,SS,CY	[57]	0	0

TABLE III-3
GENERAL SUMMARY TABLE
COLD ROLLING - RECIRCULATION
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Plant Code	Age(1)	Capacity(2), tpd	Number of Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each		
								Direct	POTW	Wastes Hauled
248B-02	NA	NA	1	Unk	Unk	Yes	Scr,EB,SS,CY	Unk	0	0
248B-03	NA	NS	3	[661]	[4.1]	Yes	Scr,EB,SS,CY	[4.1]	0	0
248B-04	NA	NA	1	Unk	Unk	Yes	Scr,EB,SS,CY	Unk	0	0
248B-05	NA	NA	1	Unk	Unk	Yes	Scr,EB,SS,CY	Unk	0	0
248C-01	1940	6.9	2	NA	NA	NA	Process uses no water or emulsions	NA	NA	NA
248C-02	1975	5.7	1	NA	NA	NA	Process uses no water or emulsions	NA	NA	NA
256A-01	1935	138	1	123	0.25	No	SS,H,RUP(99.7)	0	0	0.25
256A-02	1935	138	1	123	0.25	No	SS,H,RUP(99.7)	0	0	0.25
256B-01	1949	186	1	2,333	0.8	No	H,RUP(99.9)	0	0	0.8
256L	1962	27	1	NA	NA	NA	No solutions used	NA	NA	NA
2560-01	1959	*	1	*	*	Yes		*	*	*
2560-02	1961	*	1	*	*	Yes		*	*	*
2560-03	1968	*	1	*	*	Yes		*	*	*
2560-04	1965	*	1	*	*	No		*	*	*
2560-05	1965	*	1	*	*	No		*	*	*
284A-01	1957	219	1	Unk	0.10	No	H	0	0	0.10
320-02	1961	3,294	4	874	[2.5]	Yes	H,RUP(99.7)	0	0	[2.5]
384A-02	1958	3,354	4	3,867	43	Yes	EB,CL,SS,RUP(98.9)	43	0	0
384A-03	1970	5,757	5	3,761	10	Yes	EB,FL,FLP,CL,SS,RUP(99.7)	10	Unk	0
396D-01	1938	69	1	Unk	Unk	Yes	SSP,SS	Unk	Unk	0
396D-02	1940	246	4	Unk	Unk	Yes	SSP,SS	Unk	Unk	0
396D-03	1948	87	5	Unk	Unk	Yes	SSP,SS	Unk	Unk	0
396D-04	1954	3	1	Unk	Unk	Yes	SSP,SS	Unk	Unk	0
396E	1954	240	4	Unk	Unk	Yes	No Treatment	Unk	0	0
432A-01	1947(1971)	1,911	5	Unk	Unk	Yes	GF,E,T,NC,SCR,CL,SS,VF,H,NL	Unk	0	0
432A-02	1963	906	3	Unk	Unk	Yes	GF,E,T,NC,NL,SCR,CL,SS,VF,H	Unk	0	0
432B-01	1937(1949)	1,827	4	Unk	Unk	Yes	EB,VF,SS	0	Unk	0
432C-01	1957	3,132	4	Unk	[0.2]	Yes	VF,FLL,FLP,NN,CL,PSP,SS,OB,CT	0	0	[0.2]
448A-03	1967	780	1	Unk	Unk	Yes	CL	0	Unk	0
528-01	1955	153	1	Unk	0.03	Yes	EB,GF,CNT,RUP	0	Unk	0.03
528-02	1955	243	1	Unk	0.02	Yes	EB,CF,RUP,BD,CNT	0	Unk	0.02
528-03	1947	51	1	Unk	0.09	Yes	EB,GF,RUP,BF,CNT	0	Unk	0.09
528B-01	1954	2,862	4	Unk	30.2	Yes	NC,SS,SL,RUP,BD,CNT (2)	30.2	0	0

TABLE III-3
GENERAL SUMMARY TABLE
COLD ROLLING - RECIRCULATION
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Plant Code	Age$^{(1)}$	Capacity,$^{(2)}$ tpd	Number of Stands	Applied$^{(3)}$ Flow GPT	Process$^{(4)}$ Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each: Direct	POTW	Wastes Hauled
580C-01	1957	6	3	7,365	12.5	No	SS,RUP(99.9),BD(0.03)	0	0	12.5
580C-02	1975	6	3	1,733	12.5	No	SS,RUP(99.9),BD(0.08)	0	0	12.5
580C-03	1952	54	1	3,683	0.12	No	RUP(99.9),BD(0.003)	0.06	0.06	0
580C-04	1959	27	1	6,776	0	No	RUP(100)	0	0	0
580C-05	1964	67.5	1	1,067	0	No	RUP(100)	0	0	0
584E-03	1961(1972)	870	2	Unk	Unk	Yes	BO,CO,CR,DW,EB,F,P,FLL,FLP,IY, NL,NW,CL,SL,SS	Unk	0	0
584F-02	1947(1966)	1,494	5	Unk	(6)	Yes	SS,SL,CNT	(6)	0	0
584F-03	1956(1966)	1,965	5	Unk	(6)	Yes	SS,SL,CNT	(6)	0	0
0584F-05	1975	1,164	5	Unk	(6)	Yes	SS,SL,CNT	(6)	0	0
0584F-07	1966	990	2	Unk	Unk	Yes	SS,SL,CNT	Unk	0	0
648-01	1969	45	1	Unk	Unk	No	PSP	0	Unk	0
648-02	1966	4.5	3	Unk	Unk	No	PSP	0	Unk	0
648-03	1975	18	3	Unk	Unk	No	PSP	0	Unk	0
684B-01	1957(1961)	1,569	4	3,578	[144]	Yes	SL,SS,CNT,RUP(96),BD(4)	[144]	0	0
684D-01	1939	129	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-02	1939	63	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-03	1939	24	1	Unk	(7)	Yes	EB,SS,CL,BD,CNT,RUP	(7)	0	0
684D-04	1948	90	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-05	1946	369	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-06	1946	177	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-07	1946	159	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684F-02	1953	1,740	4	12,006	8.7	Yes	CO,FLL,FLP,GF,F,NL,NW,SL,CNT, RUP(99.9)	8.7	0	0
684F-03	1969	3,597	5	Unk	4.3	Yes	CL,F,FLL,FLP,GF,FO1,NL,NW,SL, CNT,RUP	4.3	0	0
684I-01	1958	1,149	4	3,595	751	Yes	NW,PSP,SSP,SS,CNT,RUP(75.1), BD,SL	751	0	0
700-(01-06)	Unk	Unk	1(each)	Unk	Unk	NA	No treatment	Unk	0	0
700-10	Unk	Unk	1	Unk	Unk	NA	No treatment	Unk	0	0
700-11	1974	Unk	1	Unk	Unk	NA	No treatment	Unk	0	0
724A-01	1964	510	1	Unk	Unk	Yes	No treatment	Unk	0	0
724A-02	1966	1,851	5	Unk	Unk	Yes	No treatment	Unk	0	0
760-01	1950	261	1	1,655	16.6	Unk	FF,RUP(93)	16.6	0	0
760-02	1957	165	1	2,618	26.3	Unk	FF,RUP	0	0	26.3
760-03	1954	156	1	0	0	NA	No rolling solutions used	0	NA	NA

TABLE III-3
GENERAL SUMMARY TABLE
COLD ROLLING - RECIRCULATION
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Plant Code	Age(1)	Capacity,(2) tpd	Number of Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each: Direct	POTW	Wastes Hauled
760-04	1926(1952)	42	1	0	0	NA	No rolling solutions used	0	NA	NA
760-05	1927(1963)	1.8	1	0	0	NA	No rolling solutions used	0	NA	NA
760-06	1927(1953)	20.4	1	0	0	NA	No rolling solutions used	0	NA	NA
760-07	1944(1965)	12.3	1	0	0	NA	No rolling solutions used	0	NA	NA
792B-01	1952	369	1	Unk	Unk	No	H	0	0	Unk
792B-02	1945	132	1	Unk	Unk	No	H	0	0	Unk
792B-03	1961	165	1	Unk	Unk	No	H	0	0	Unk
792C-01	1955	204	1	593	Unk	Yes	SS,F,CNT	Unk	0	0
792C-02	1970	120	1	1,080	Unk	Yes	SS,F,CNT	Unk	0	0
792C-03	1963	51	1	734	Unk	Yes	SS,F,CNT	Unk	0	0
856E-01	1946	249	1	1,439	Unk	No	H	0	0	Unk
856P (01-21)	1909(1918)	822(comb.)	1(each)	4,390 (comb)	[0.8]	Yes	H,RUP(99.9)	0	0	[0.8]
860B-02	1967	2,244	6	Unk	1,283	Yes	EB,SS,FLL,FLP,NW,CL	1,283	0	0
860B-04	1964	4,194	5	Unk	687	Yes	EB,SS,FLL,FLP,NW,CL	687	0	0
864B-01	1947	1,419	5	3,552	5.1	Yes	FLL,FLP,NL,NA,CL,NO$_3$,SS,CNT, RUP(99.9)	5.1	0	0
864B-02	1965	813	3	3,542	354	Yes	NL,NA,CL,NO$_3$,SS,CNT,RUP(90)	354	0	0
864B-03	1974	1,986	5	3,625	7,3	Yes	NL,NA,CL,NO$_3$,SS,CNT,RUP(99.9)	7.3	0	0
948C-03	1939(1966)	894	3	3,624	1369	Yes	T,SS,FLP,FLL,CNT,RUP(62)	1,369	0	0

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(1) The age listed represents the first year of production. Number in parentheses designate years of rebuilds or major modifications.
(2) The daily capacity listed was determined by multiplying the 1976 average tonnage per turn by a factor of three.
(3) The applied flow represents the total process water flow applied to the cold rolling mill.
(4) The process water flow represents the water leaving the cold rolling mill after any internal recycle systems.
(5) Flow value measured during sampling visit for these 10 mills equals 8.8 gpt.
(6) Flow value measured during sampling visit for these 3 mills equals 1.1 gpt.
(7) Company reports total flow for all seven mills. The flow rate is equivalent to 5.7 gpt.
*: Confidential
: Flow values in brackets were received at plant visits or in the response to D-DCP's.

NOTE: For a definition of the C&TT Codes, see Table VII-1.

TABLE III-4

GENERAL SUMMARY TABLE
COLD ROLLING - COMBINATION

Plant Code	Age(1)	Capacity(2), tpd	Total Number of Stands	Number of Recirculated Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode with Typical GPT for Each: Direct	POTW	Wastes Hauled
0432D-01	1968	3,486	5	3	Unk	[156]	Yes	DW,F,P,FLL,T	[156]	0	0
0448A-01	1952(65)	1,488	5	4	Unk	Unk	Yes	CL	Unk	Unk	0
0448A-02	1966	624	3	2	Unk	Unk	Yes	CL	Unk	Unk	0
0584A-02	1965	4,437	5	4	Unk	[55]	Yes	M,A,E,EB,FLL,FLP,NL,SCR,T, SS,OT	[55]	0	0
0584E-01	1961	2,004	5	4	Unk	[512]	Yes	BO,CU,CR,DW,EB,F,P,FLL, FLP,GF,IX,NL,NW,CL,SL,SS	[512]	0	0
0584E-04	1970	3,999	5	3	Unk	Unk	Yes	BO,CO,CR,DW,EB,F,P,FLL, FLP,GF,IX,NL,NW,CL,SL,SS	Unk	0	0
0856D-01	1938(75)	1,092	5	4	Unk	Unk	Yes	EB,FLP,FL01,SS,CNT	Unk	0	0
0856D-02	1940(55)	1,482	5	4	Unk	Unk	Yes	EB,FLP,FL01,SS,CNT	Unk	0	0
0856D-03	1971	4,620	5	3	Unk	Unk	Yes	EB,FLP,FL01,SS,CNT	Unk	0	0
0856F-01	1953	3,132	4	3	552	[112]	Yes	CR,NW,FLL,T,CL,CNT,RUP(83)	[112]	0	0
0856F-02	1953	1,782	5	4	970	179	Yes	CR,NW,FLL,T,CL,CNT,RUP(82)	179	0	0
0860B-03	1948	3,105	4	2	14,235	325	Yes	EB,FLL,FLP,NL,NW,CL,SL, RUP(98),CNT(5)	325	0	0
0868A-01	1948	2,658	4	3	Unk	54	Yes	F,FLP,FL01,NL,CL,SL,SS,CNT	54	0	0
0868A-02	1963	1,674	6	5	Unk	481	Yes	F,P,FLP,FL01,CL,SL,SS,CNT	481	0	0
0868A-03	1964	570	2	1	Unk	25	Yes	F,P,FLP,FL01,CL,SL,SS,CNT	25	0	0
0920C-01	1954	2,121	4	3	1,630	114	Yes	EB,VF,SS,CNT,RUP(99)	114	0	0
0948C-01	1954	2,730	2	4	1,477	870	Yes	T,FLP,FLL,CNT,RUP(50)	870	0	0
0948C-02	1965	3,438	5	4	503	[207]	Yes	F,S,FLA,FL01,CNT,RUP(59)	[207]	0	0
0948C-04	1961	2,082	5	4	8,127	[1,500]	Yes	T,SS,RUP(82)	[1,500]	0	0

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(1) The age listed represents the first year of production. Numbers in parentheses designate years of rebuilds or major modifications.

(2) The daily capacity listed was determined by multiplying the 1976 average tonnage per turn by a factor of three.

(3) The applied flow represents the total process water flow applied to the cold rolling mill.

(4) The process water waste flow represents the water leaving the cold rolling mill after any internal recycle systems.

: Flow values in brackets were received at plant visits or in the responses to D-DCP's.

NOTE: For a definition of the C&TT Codes, see Table VII-1.

TABLE III-5

GENERAL SUMMARY TABLE
COLD ROLLING - DIRECT APPLICATION

Plant Code	Age(1)	Capacity(2), tpd	Number of Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each: Direct	POTW	Wastes Hauled
020B-04	1957	30	1	Unk	Unk	No	H	Unk	0	Unk
060-04	1940	246	1	Unk	Unk	Yes	VF,FLP,NL,T,A,SS	Unk	0	0
060-05	1938	1,308	1	Unk	Unk	Yes	EB,FG,FLP,NL,CL,SS,A	Unk	0	0
060-06	1942	948	1	Unk	Unk	Yes	EB,FG,FLP,NL,CL,SS,A	Unk	0	0
060-07	1956	2,529	1	Unk	Unk	Yes	EB,FG,FLP,NL,CL,SS,A	Unk	0	0
060-08	1966	2,292	1	Unk	Unk	Yes	EB,FG,FLP,NL,CL,SS,A	Unk	0	0
060B-01	1963	1,146	1	Unk	Unk	Yes	EB,GF,CL,SS	Unk	0	0
060D-01	1926(1929) (1948)	NA	1	Unk	Unk	Yes	NL,SL,A	Unk	0	0
060D-03	1929(1958)	408	1	Unk	Unk	Yes	NL,SL,A	Unk	0	0
112A-01	1947(1951)	1,524	5	481	481	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	481	0	0
112A-02	1951	2,811	4	246	246	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	246	0	0
112A-03	1936	1,230	5	Unk	Unk	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	Unk	0	0
112A-04	1936	1,230	5	Unk	Unk	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	Unk	0	0
112A-05	1957	1,968	5	3,081	3,081	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	3,081	0	0
112A-06	1963	861	2	607	607	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	607	0	0
112B-01	1936(1950)	2,856	4	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-02	1936(1963)	2,310	4	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-03	1936	1,680	1	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-04	1936	1,392	1	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-05	1936	1,968	1	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-06	1936	1,944	1	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
176-01	1921(1928)	630	1	Unk	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-02	1929	63	1	$\boxed{233}$	$\boxed{233}$	Yes	EB,FLP,CL,T,CY	$\boxed{233}$	0	0
176-03	1933	NA	1	Unk	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-04	1934	3.0	1	Unk	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
256N- (01-24)	1928	1.5(each)	1(each)	Unk	Unk	Yes	SS	Unk	0	0
284A-02	1957	186	1	0.5	0.5	Yes	No treatment(no oil solutions used in process)	0.5	0	0

TABLE III-5
GENERAL SUMMARY TABLE
COLD ROLLING - DIRECT APPLICATION MILLS
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Plant Code	Age$^{(1)}$	Capacity,$^{(2)}$ tpd	Number of Stands	Applied$^{(3)}$ Flow GPT	Process$^{(4)}$ Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each: Direct	POTW	Wastes Hauled
320-01	1936(1961)	2,310	3	Unk	Unk	Unk	H	Unk	0	Unk
384A-01	1933(1948)	1,356	5	262	262	Yes	SL,SS	262	0	0
584A-01	1948	1,491	3	603	603	No	SS,OT	603	0	0
584C-01	1947	2,103	4	1,426	1,426	Yes	SS,SL,CLB,FDS,CNT	1,426	0	0
584E-02	1961	2,256	1	Unk	Unk	Yes	BO,CO,CR,DN,EB,FLL,FLP,GF,NL, NW,SL,SS	Unk	0	0
584F-04	1959	1,842	4	[424]	[424]	Yes	SS,SL,CNT,EB,GF,NL	424	0	0
584F-06	1972	1,107	2	Unk	Unk	Yes	SS,SL,CNT,EB,GF,NL	Unk	0	0
684C-01	1937	126	4	Unk	Unk	Yes	PSP,SS,OT,CNT,T	Unk	0	0
684C-02	1964	1,017	2	142	142	Yes	PSP,SS,OT,CNT,T	142	0	0
684I-02	1958	951	1	23	23	Yes	NW,PSP,SSP,SS,SL,OT,CNT	23	0	0
856F-03	1962	804	2	287	287	Yes	CR,NW,NL,FLL,T,CL,CNT	287	0	0
860B-01	1963	855	2	168	168	Yes	EB,SS,FLL,FLP,NW,CL	168	0	0
920A-01	1930(1939)	1,953	4	273	273	Yes	CO,FLL,NL,CL,CNT	273	0	0
920G-01	1937(1964)	318	3	1,604	1,604	Yes	EB,GF,CL,SS,CNT	1,604	0	0
920G-02	1957	2,031	5	1,477	1,477	Yes	EB,GF,CL,SS,CNT	1,477	0	0
948A-01	1935	1,380	3	939	939	Yes	EB,VF,GF,SS,FLP,FLL,FL	939	0	0
948A-02	1937	1,500	4	864	864	Yes	EB,VF,GF,SS,FLP,FLL,FL	864	0	0

---

(1) The age listed represents the first year of production. Numbers in parentheses designate years of rebuilds or major modifications.

(2) The daily capacity listed was determined by multiplying the 1976 average tonnage per turn by a factor of three.

(3) The applied flow represents the total process water flow applied to the cold rolling mill.

(4) The process flow represents the total process water flow leaving the process and entering the treatment system, if any.

(5) Plant 112B reported a total flow for the six mills: 01-06. The applied, process and discharge flows for these mills was calculated by using a combined tonnage and equals 238 gal/ton.

: Flow values in brackets were received during plant visits or in the response to D-DCP's.

NOTE: For a definition of C&TT Codes, see Table VII-1.

TABLE III-6

COLD ROLLING - RECIRCULATION DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity** of Operations (Tons)	% of Total Daily Capacity
Operations Sampled for Original Guidelines Study	7*	4.2	12,738	13.4
Operations Sampled for 1977 Toxic Pollutant Study	17	10.1	16,986	17.8
Operations Sampled for 1980 Toxic Organics Survey	45 incl. 12 above	26.8 incl. 7.1 above	20,478 incl. 3252 above	21.5 incl. 3.4 above
Total No. of Operations Sampled	57	33.9	46,950	49.2
Operations Solicited via Detailed DCP	20 incl. 15 above	11.9 incl. 8.9above	26,868 incl. 17,887 above	28.2 incl. 18.8 above
Operations Sampled and/or Solicitated via Detailed DCP	62	36.9	55,931	58.6
Operations Responding to DCP's	143	~85.0	81,086	~85.0
Estimated Total Number of Recirculation Operations	168	100.0	95,395	100.0

---

* One recirculation operation was sampled for the original study which is not included in this total. This mill was resampled during the Toxic Pollutant study and only the newer data is used for the updated data base.

**Capacities for 1976 were used to determine the appropriate daily capacities.

TABLE III-7

COLD ROLLING - COMBINATION DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity ** of Operations (Tons)	% of Total Daily Capacity
Operations Sampled for Original Guidelines Study	1*	4.5	2,004	3.7
Operations Sampled for 1977 Toxic Pollutant Study	0	0	0	0
Operations Sampled for 1980 Toxic Organics Survey	6	27.3	19,680	36.0
Total No. of Operations Sampled	7	31.8	21,684	39.6
Operations Solicited via Detailed DCP	0	0	0	0
Operations Sampled and/or Solicited via Detailed DCP	7	31.8	21,684	39.6
Operations Responding to Basic DCP's	19	~85.0	46,514	~85.0
Estimated Total Number of Combination Operations	22	100.0	54,722	100.0

---

*Another combination operation was sampled during the original study (Plant YY-2). This mill, was resampled during the Toxic Pollutant study and only the newer data is used for the updated data base.

**Capacities for 1976 were used to determine the appropriate daily capacities.

TABLE III-8

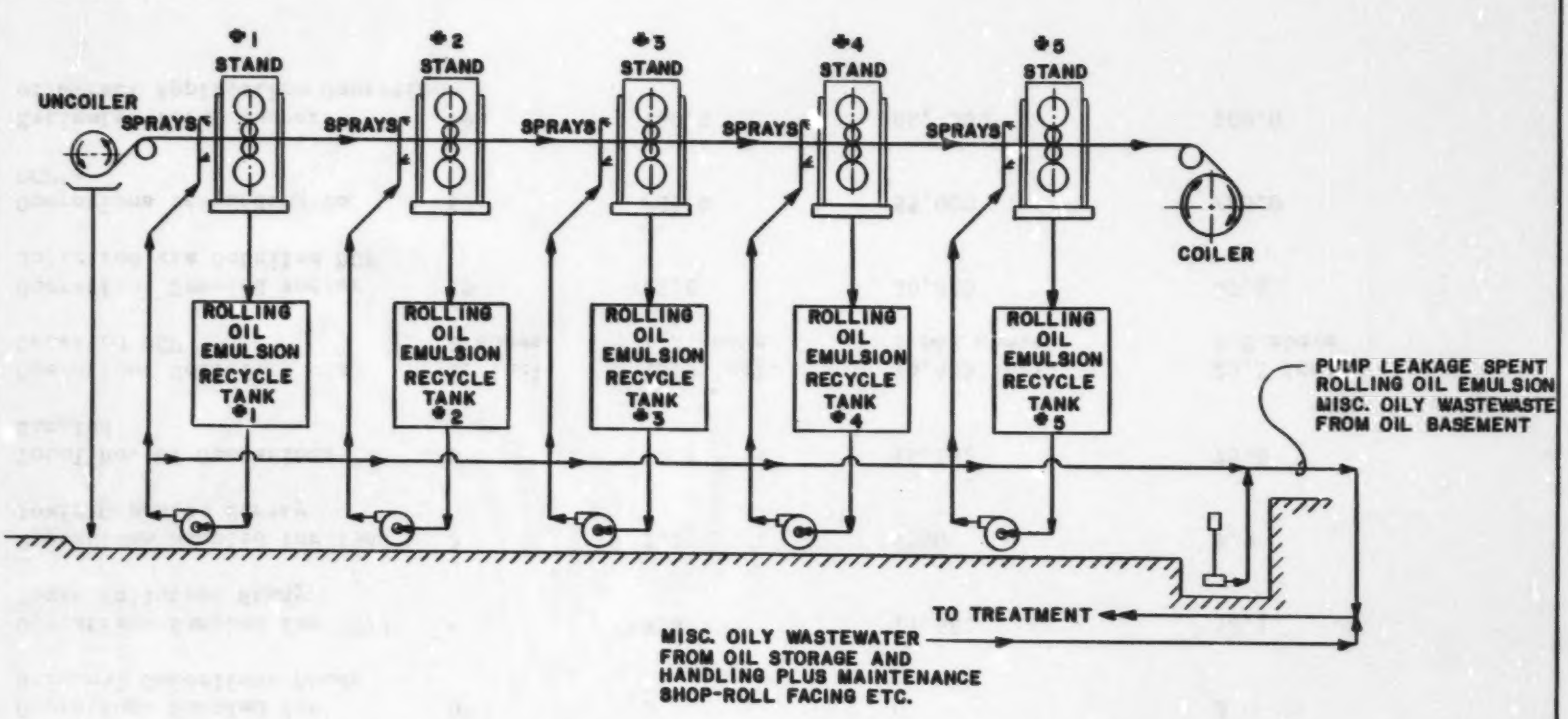
COLD ROLLING - DIRECT APPLICATION DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity ** of Operations (Tons)	% of Total Daily Capacity
Operations Sampled for Original Guidelines Study	0*	0	0	0
Operations Sampled for 1977 Toxic Pollutant Study	6	7.6	11,682	18.1
Operations Sampled for 1980 Toxic Organics Survey	2	2.5	4500	6.9
Total No. of Operations Sampled	8	10.1	16,182	25.0
Operations Solicited via Detailed DCP	11 incl. 1 above	13.9 incl. 1.3 above	16,485 incl. 1,842 above	25.5 incl. 2.8 above
Operations Sampled and/or Solicited via Detailed DCP	18	22.8	30,825	47.6
Operations responding to DCP's	67	~85.0	55,000	~85.0
Estimated Total Number of Direct Application Operations	79	100.0	64,700	100.0

---

*One direct application operation was sampled for the original study (Plant VV-2) which is not included in this total. However, this mill was resampled during the Toxic Pollutant Survey and only the newer data was used for the updated data base.

**Capacities for 1976 were used to determine the appropriate daily capacities.

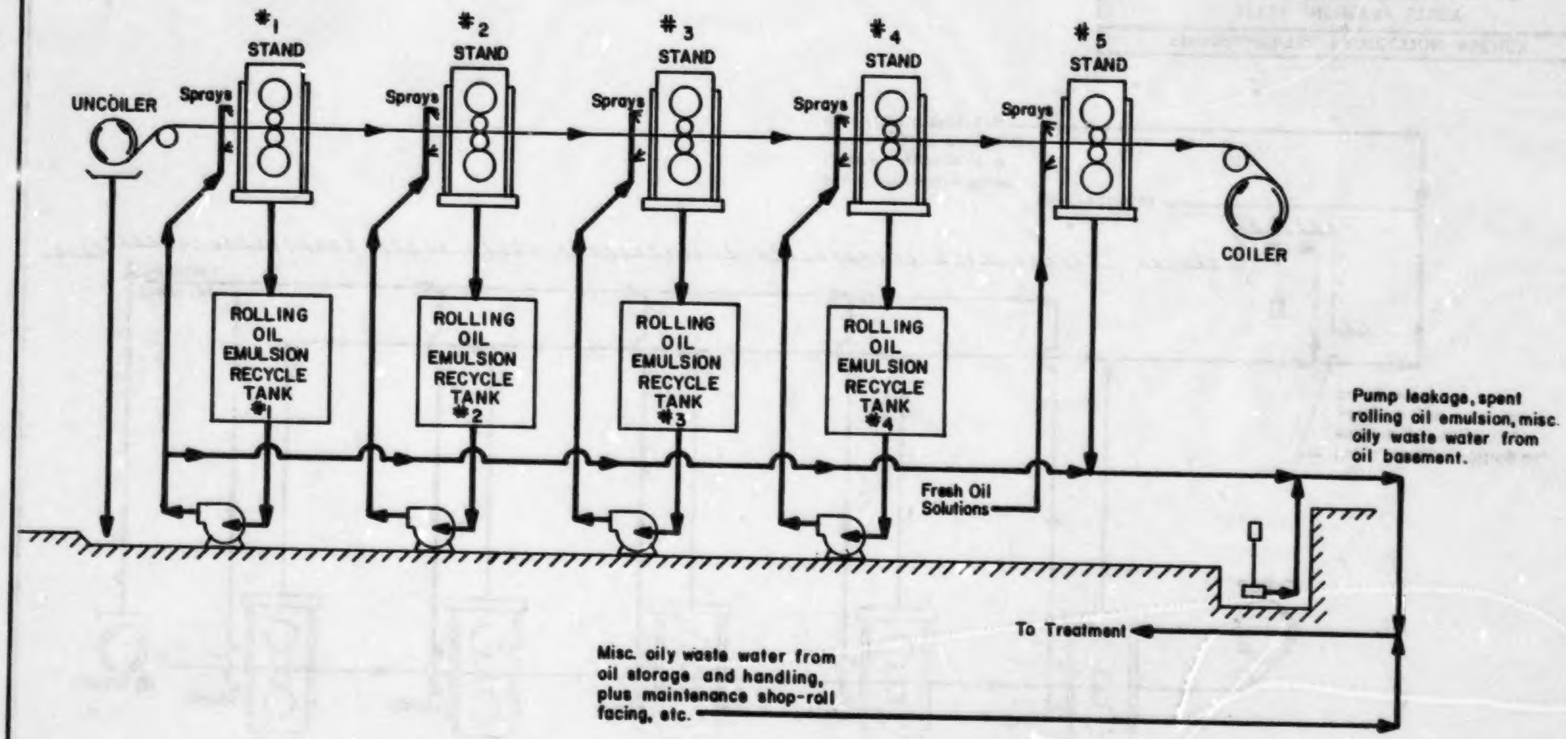

UNCOILER
SPRAYS
#1 STAND
SPRAYS
#2 STAND
SPRAYS
#3 STAND
SPRAYS
#4 STAND
SPRAYS
#5 STAND
COILER
ROLLING OIL EMULSION RECYCLE TANK #1
ROLLING OIL EMULSION RECYCLE TANK #2
ROLLING OIL EMULSION RECYCLE TANK #3
ROLLING OIL EMULSION RECYCLE TANK #4
ROLLING OIL EMULSION RECYCLE TANK #5
PUMP LEAKAGE SPENT ROLLING OIL EMULSION MISC. OILY WASTEWASTE FROM OIL BASEMENT
TO TREATMENT
MISC. OILY WASTEWATER FROM OIL STORAGE AND HANDLING PLUS MAINTENANCE SHOP-ROLL FACING ETC.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING MILL
RECIRCULATION TYPE
PROCESS FLOW DIAGRAM

DWG.5/11/74 REV.2/25/76
REV.2/19/76

FIGURE III-1

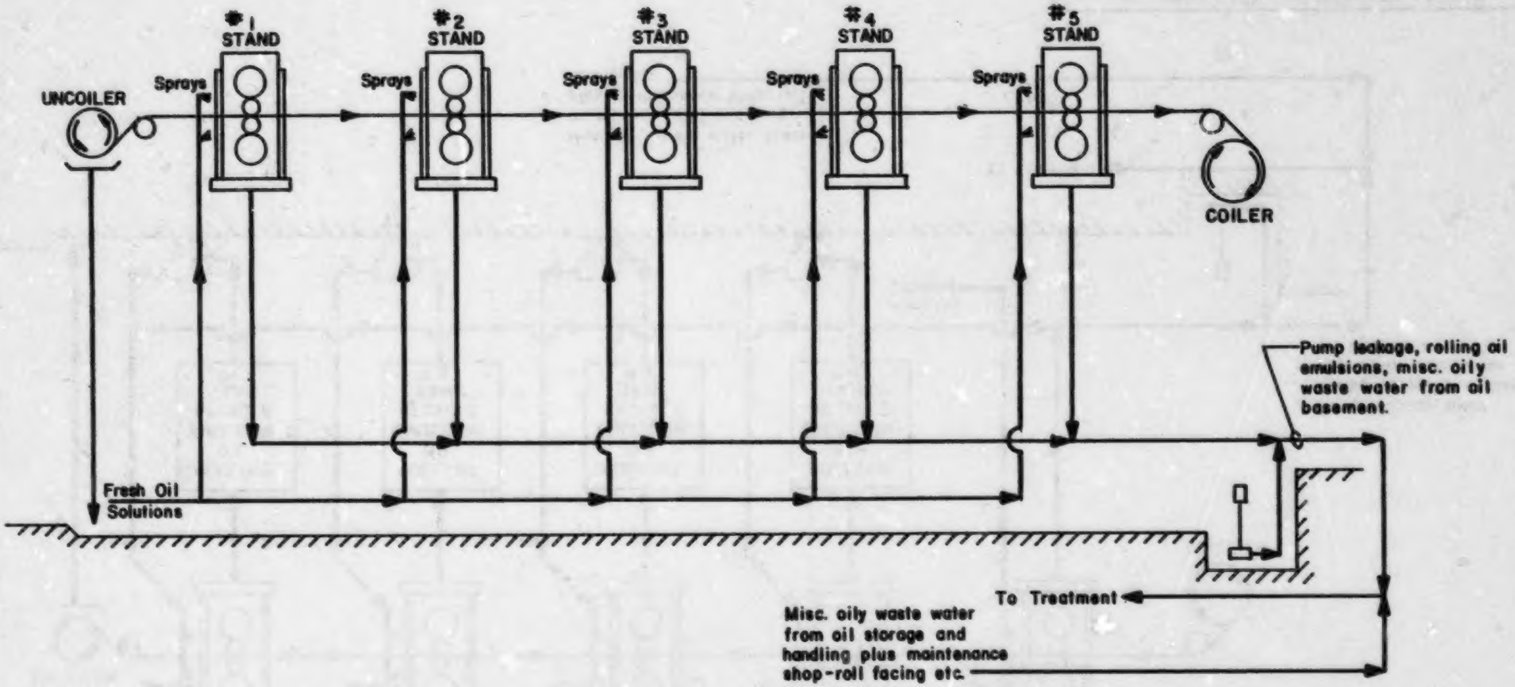

UNCOILER
Sprays
#1 STAND
Sprays
#2 STAND
Sprays
#3 STAND
Sprays
#4 STAND
Sprays
#5 STAND
COILER
ROLLING OIL EMULSION RECYCLE TANK #1
ROLLING OIL EMULSION RECYCLE TANK #2
ROLLING OIL EMULSION RECYCLE TANK #3
ROLLING OIL EMULSION RECYCLE TANK #4
Fresh Oil Solutions
Pump leakage, spent rolling oil emulsion, misc. oily waste water from oil basement.
To Treatment
Misc. oily waste water from oil storage and handling, plus maintenance shop-roll facing, etc.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING MILL
COMBINATION TYPE
PROCESS FLOW DIAGRAM

Dwn.6/5/79

FIGURE III-2


#1 STAND
#2 STAND
#3 STAND
#4 STAND
#5 STAND
Sprays
Sprays
Sprays
Sprays
Sprays
UNCOILER
COILER
Pump leakage, rolling oil emulsions, misc. oily waste water from oil basement.
Fresh Oil Solutions
To Treatment
Misc. oily waste water from oil storage and handling plus maintenance shop-roll facing etc.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING MILL
DIRECT APPLICATION TYPE
PROCESS FLOW DIAGRAM

Dwn.6/6/79

FIGURE III-3

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION IV

SUBCATEGORIZATION

Introduction

For cold rolling operations, the main element that affects segmentation is the method of oil application. Flow rates were found to differ depending on the oil application system used. Hence, limitations and standards were developed separately for recirculation, combination, and direct application mills.

Basically, the difference in flow rates is the only factor affecting segmentation of the cold rolling subdivision. Mill age and size, product type, raw materials, wastewater characteristics, treatability, and geographic location were considered, but the analysis showed that none of these factors warrant further segmentation of the cold rolling subdivision. Each of these elements is reviewed below.

Factors Considered in Subcategorization

Manufacturing Process and Equipment

To determine if this factor had an effect on segmentation of the cold rolling subdivision, the Agency analyzed two elements. First, the type of cold rolling performed (i.e., temper, tandem, or reversing mill) was studied to determine its effect on effluent flow rates or quality. The second element examined was the configuration of the mill itself, such as the number of stands present. These elements are discussed below.

A. Type of Cold Rolling

The Agency analyzed both the sampling data and DCP responses and found no relationship between the type of cold rolling operation (e.g., temper or tandem), and either the wastewater flow rates or effluent quality. Although many mills were identified by the industry in DCPs only as "cold mills," data for mills that were clearly identified showed no correlations that indicated that further segmentation would be necessary. For example, mills that perform large thickness reductions have similar discharge flows and achieve similar effluent quality as those mills, such as skin mills, which perform small thickness reductions.

B. Mill Configuration

The Agency also examined the effect of the number of mill stands on wastewater quality and quantity. All three types of mills were examined. The mills analyzed varied from small one stand operations to large six stand complexes. To determine if the number of stands affected flow rate, the flow data for all mills were tabulated according to the number of stands present as shown in Table IV-1. The data indicate that the mills with the fewest number of stands have the lower flow rates. However, some of the larger multi-stand mills discharge at the same low flow rates. The single stand mills had the lowest discharge rates and were clearly distinguishable from the other mills in both the recirculation and direct application segments. The Agency has, therefore, established separate subsegments for single and multiple stand mills in both the recirculation and direct application segments. Combination mills necessarily have more than one stand. No clear distinction could be made between the various combination mills on the basis of the number of stands.

The data were also analyzed to determine if mill configuration has an effect on wastewater quality. Of the mills sampled, most were five stand mills. However, there were a few mills with fewer stands and some with more than five stands. The raw waste data do not show any significant variations with mill configuration. Similar types of oils are used regardless of the number of mill stands. The effluent concentrations of conventional pollutants (i.e., TSS and oil & grease) were found to be relatively consistent among and between the different types of mills (i.e., recirculation, direct application). The sampling data demonstrate that acceptable effluent quality is dependent on design and operation of the treatment system and not on mill configuration.

Final Product

Cold rolling operations yield a wide variety of final products (see Table III-2). An analysis was done to determine if the final product rolled (e.g., sheet, strip) affected flow rates, wastewater characteristics or other elements. The three main products analyzed were sheet, strip, and flat wire. These three products account for 83% of the total tonnage reported by the industry. Other products were not reviewed, because multiple products are rolled at those mills, or because flow rates and other analytical data were not provided by the industry. The data show that the final product rolled does not have a significant effect on either discharge flow or wastewater characteristics. Hence, further segmentation on this basis is not warranted.

Strip and sheet mills were first analyzed because of their similarities. The data indicate that more strip mills are recirculation mills, while more sheet mills are direct application mills. This resulted in slightly higher average applied flow rates for the sheet mills. This difference, however, is not significant and is covered by the basic segmentation by mill type. Aside from toxic organic pollutants found in the wastewaters from the various mills for all products, no differences were found in the wastewater characteristics between the two mills.

Wire mills are usually small operations with capacities in the range of hundreds of tons per year as opposed to other operations which produce thousands of tons per day. Also, reported applied flow rates are significantly higher at flat wire mills than at any other type of cold rolling operation. For example, an applied rate of 195,000 gallons per ton was reported for one wire mill. This is approximately 40 times the highest flow rate reported by either a strip or sheet mill. The reason for these higher than normal flow rates is the small capacity of these mills and not any special water requirements. Wire mills only process products in small batches. Also, when the mill is operated, it is run for only a small portion of a turn. When the flow values were calculated on a gallon/ton basis it was assumed that the mill operated for an entire eight hour turn. Since this is not the case for wire mills, the calculated applied flow rates are disproportionately higher than for any other types of cold operation. Despite these inordinately high calculated applied flows, the Agency found that recirculation mills of all types can achieve similar discharge flow rates through better operating practices. Hence, it is not necessary to differentiate between products rolled at cold mill operations.

Raw Materials

Carbon, stainless and other types of steel are used as raw material in cold rolling mills. It was found that while the type of steel rolled sometimes affects mill operation, it does not significantly affect the eventual discharge quantity or quality after treatment in BPT treatment systems. Although specialty steel mills tend to have smaller production capacities than carbon steel mills, the discharge flow rates (gal/ton) for both types of mills are about the same. Additionally, the monitoring data for both types of mills indicate similar types of pollutants were present in these wastewaters, although at varying levels. Accordingly, the Agency concluded that further segmentation based upon type of raw material used (i.e., the type of steel rolled) is not appropriate.

Wastewater Characteristics

Within the cold rolling subdivision, no differences were found in wastewater characteristics between operations that process specialty steels and those that process carbon steels. The same types of pollutants were found in the wastewaters from both types of mills. However, the Agency found that operations processing specialty steel products generate higher levels of chromium, copper, lead, nickel, and zinc than do carbon mills. At the levels present in these wastewaters, this difference has no effect on the selection of treatment components or on the development of appropriate effluent limitations.

Specialty steels are produced by adding alloying agents to the steel as it is being produced. These steels normally contain higher levels of certain metallic elements such as chromium and nickel which give the steel added properties. Because the specialty steels contain these metals, there is a greater tendency for them to be released as they progress through steel finishing operations, such as cold rolling.

The data gathered during the sampling visits demonstrate that wastewaters from specialty operations contain higher concentrations of certain metals than do wastewaters from carbon steel operations. The data presented below for recirculation mills illustrate this point.

	Carbon Steel Operations		Specialty Steel Operations	
	Avg. Conc. (mg/l)	Max. Conc. (mg/l)	Avg. Conc. (mg/l)	Max. Conc. (mg/l)
Chromium	0.01	0.03	5.3	10.4
Copper	1.4	2.0	11.7	28.4
Lead	1.3	2.3	3.1	10.4
Nickel	0.6	0.9	5.8	11.5
Zinc	0.5	0.5	5.7	9.5

As can be seen by these data, mills that process specialty steels generate, on average, 2.4 (lead) to 530 (chromium) times as much metals as do the carbon steel mills. These data also show that the metals in both carbon and specialty steel wastewaters are present at concentrations higher than treatability levels. The treatment technologies for removal of these metals will produce the same effluent quality. At the levels at which these metals are present in both carbon and specialty steel wastewaters, they will not affect the size or cost of the treatment systems. These metals are present primarily in particulate form.

For the other pollutants found in cold rolling wastewaters, no differences were found due to product type. The previously limited pollutants (i.e., total suspended solids, oil and grease) were found at similar levels at most operations. Some waste streams are more concentrated than others because of collection practices at some mills. Depending on the product being rolled, different oils and greases are used at different mills and within a given mill. Many of the oils and greases are proprietary in nature and are chosen mainly for their lubricating and cooling properties. Subcategorization on the basis of the various types of oils used is not practical due to the wide variety of oils used, the complex nature of those oils and the paucity of data available for characterizing these oils. It was found that acceptable levels of oil and grease can be attained in all discharges provided that properly designed and operated separation and removal facilities are used to treat the wastewaters.

Toxic organic pollutants found in cold rolling wastewaters are believed to result from the oil cleaning solutions used in the mills. The Agency found that the presence of these compounds is widespread, and that they appear at varying levels in almost all oil solutions and raw wastewaters discharged from cold rolling operations. The characteristics of the wastewaters from mills using different oil mixtures is also varied. Different organic pollutants were detected at the different mills sampled. No clear distinctions could be made on the basis of toxic organic pollutants found in the oil solutions in raw wastewaters sampled.

The Agency has concluded that further segmentation of the cold rolling subdivision is not warranted on the basis of wastewater characteristics.

Wastewater Treatability

The Agency analyzed the treatability of the wastewaters from different cold rolling operations and found no significant differences. The same types of treatment systems treat these wastewaters and attain similar effluent quality. It should be noted, however, that the Agency found that non-emulsifiable oils are used at some mills. For these mills the emulsion breaking steps in the treatment schemes are not needed.

Size and Age

The Agency considered whether size and age might affect segmentation of cold rolling operations. The Agency examined the correlations between age and size, and among elements such as wastewater generation, the ability to install treatment, and the ability to recycle wastes adequately to achieve desired flow rates. The analysis did not show any relationships that affect the segmentation beyond that already considered.

Size was considered as a possible factor for segmentation. The cold rolling mills vary greatly in physical size, layout and product size. However, these factors revealed no significant relationships to process water usage, discharge rates, effluent quality or any other pertinent factor. Figures IV-1 through IV-5 are plots of discharge flow vs size and discharge flow vs age. On the plots, the model flow rates used as the basis for the limitations are also shown. As can be seen, the model flow rates are achieved by a significant percentage of mills of all sizes. Likewise, the plots of flow vs. age reveal no correlation. Hence, the age of a mill has no significant impact on the discharge flow from that mill.

There is a slight correlation between mill size and age. The 25 largest mills have an average age (not counting rebuilds) of 18.5 years, while the 25 smallest mills have an average age of 27 years.

This indicates that as technology and material resource requirements increased over the years, the size of an average cold rolling mill gradually increased to accommodate the higher demand for cold rolled products and to take advantage of the economy associated with the larger mills. This relationship, however, has no effect on discharge flow rates or effluent quality.

The effect of age on the ability, ease, and cost of installing or retrofitting treatment systems was also analyzed. Table IV-2 lists those plants where retrofitted treatment systems were installed for older mills. The numerous examples effectively illustrate the ability to retrofit treatment systems onto older mills. Cost data received in the D-DCPs for all iron and steel subcategories were tabulated. Those data show that little or no cost was attributable to retrofitting pollution control equipment by the industry. This analysis was detailed in Volume I of this development document. Based upon this analysis, the Agency concludes that there are no significant costs associated with retrofitting pollution control technology and that technology can be retrofitted on both newer and older mills with about the same degree of difficulty.

Further analysis of the data did not reveal any relationship between age and wastewater characteristics or treatability. Older mills discharge the same kinds and amounts of pollutants as newer mills and the discharges from both older and newer mills can be treated equally. This is also true for the larger and smaller mills. Some of the largest mills have installed the best recirculation systems and achieve some of the lowest discharge flows on a gallon/ton basis. Wastewaters from larger mills can be treated as effectively as those from smaller mills.

Based upon the above, the Agency finds that both old and newer production facilities generate similar raw wastewater pollutant loadings; that pollution control facilities can be and have been retrofitted to both old and newer production facilities without substantial retrofit costs; that these pollution control facilities can and are achieving the same effluent quality; and, that further subcategorization or further segmentation within this subcategory on the basis of age or size is not appropriate.

Geographic Location

Examination of the raw waste characteristics, process water application rates, discharge rates, effluent quality and pertinent factors associated with plant location reveals no general relationship or pattern. Cold rolling mills are located in fourteen states, but over half of the total number are located in Pennsylvania and Ohio. Seventeen are located west of the Mississippi River (14 in Missouri and 3 in California). No significant differences due to geographic location were found when data for all plants were reviewed.

The Agency also examined in relation to geographic location, the remand issue dealing with consumptive use of water in "arid" and "semi-arid" regions of the country. However, since cooling towers are not components of the model treatment systems for cold rolling operations, there is no consumptive use of water which will result from compliance with the limitations and standards. Consequently, further segmentation on this basis is not appropriate.

Process Water Usage

This factor, more than any other, affects the subcategorization of cold rolling operations. The applied and discharge flow rates differ significantly depending on the type of oil application system used at the mills and the number of mill stands (single stand vs multi-stand).

Flow rates for the different type mills are shown in Table IV-3. As can be seen, both the applied and discharge flow rates differ significantly. This relationship was the basis for segmenting the cold rolling subdivision of the cold forming subcategory into three segments, i.e., recirculation mills, combination mills and direct application mills.

Although the wastewater characteristics are similar for all mills, the Agency concluded that different effluent limitations are appropriate to account for the wide variations in flow rates among these operations. This relationship is reviewed in more detail later in this report.

TABLE IV-1

EFFECT OF MILL CONFIGURATION ON THE DISCHARGE FLOW RATE COLD ROLLING

Type of Mill	Total No. of Operations Reporting Flows	No. of Operations Achieving the Model Flow Rate(1)	Percent
1. Recirculation			
1 - Stand	18	13	72
3 - Stand	6	3	50
4 - Stand	8	4	50
5 - Stand	9	8	89
2. Combination			
2 - Stand	2	1	50
4 - Stand	4	3	75
5 - Stand	6	3	50
6 - Stand(2)	1	0	0
3. Direct Application			
1 - Stand	3	2	67
2 - Stand	2	1	50
3 - Stand(3)	3	0	0
4 - Stand	4	3	75
5 - Stand	3	1	33

---

(1) BPT and BAT flow basis

(2) The flow at this plant may be reduced through better operating practice, i.e., closer control on recycle rates at recirculation stands and application rates on the direct application stand. Mills with lesser number of stands have higher discharge flow rates than this 6 stand mill.

(3) The flow at this plant may be reduced through closer control of the application rates. Plants with more and less stands are able to achieve the model flow rates.

TABLE IV-2

EXAMPLES OF PLANTS THAT HAVE DEMONSTRATED THE ABILITY TO RETROFIT POLLUTION CONTROL EQUIPMENT COLD ROLLING

Plant Code	Mill Age (Year)	Treatment Age (Year)
020G	1951	1975
060	1936	1967
060B	1963	1968
060D	1926	1968
122A	1947	1971
112B	1936	1971
176	1921	1963
384A	1938	1948
396D	1938	1959
432A	1947	1970
432B	1937	1966
432C	1957	1964
448A	1952	1969
528	1955	1975
584A	1965	1971
584C	1947	1947 & 1977
584F	1947	1965
684C	1937	1950
684D	1939	1970
684F	1937	1969
760	1950	1971
856D	1938	1959 & 1967
856P	1909	1968
864B	1947	1972
868A	1948	1971
920A	1930	1978
948A	1935	1976
948C	1954	1970

TABLE IV-3

RELATIONSHIP BETWEEN FLOW AND OPERATION TYPE COLD ROLLING

	Applied Process Flow (GPT)	Discharge Flow* (GPT)	Model Flow (GPT)
Recirculation Mills			
Single Stand	1551	3.7	5
Multi Stand	3524	9.9	25
Combination Mills	3930	258	300
Direct Application Mills			
Single Stand	86*	86	90
Multi Stand	383*	383	400

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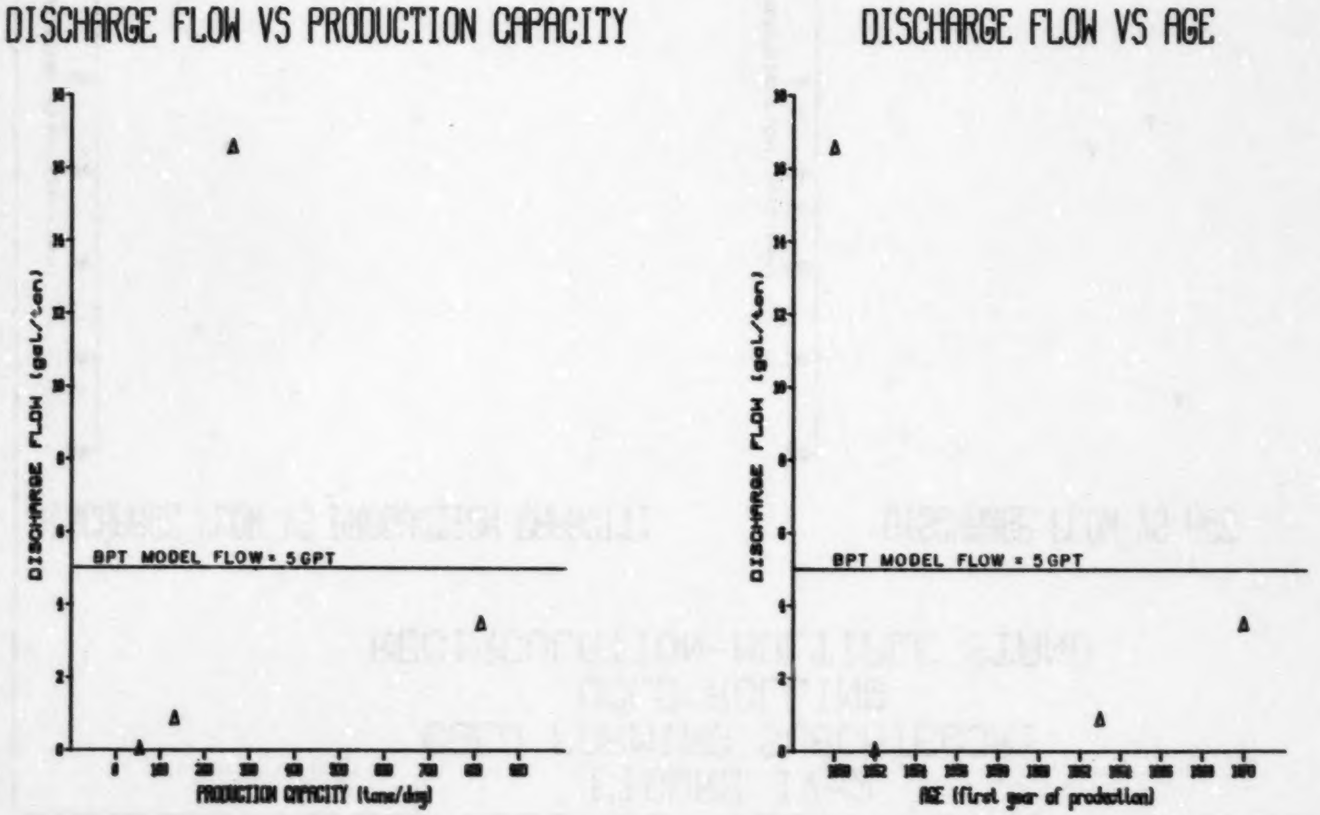
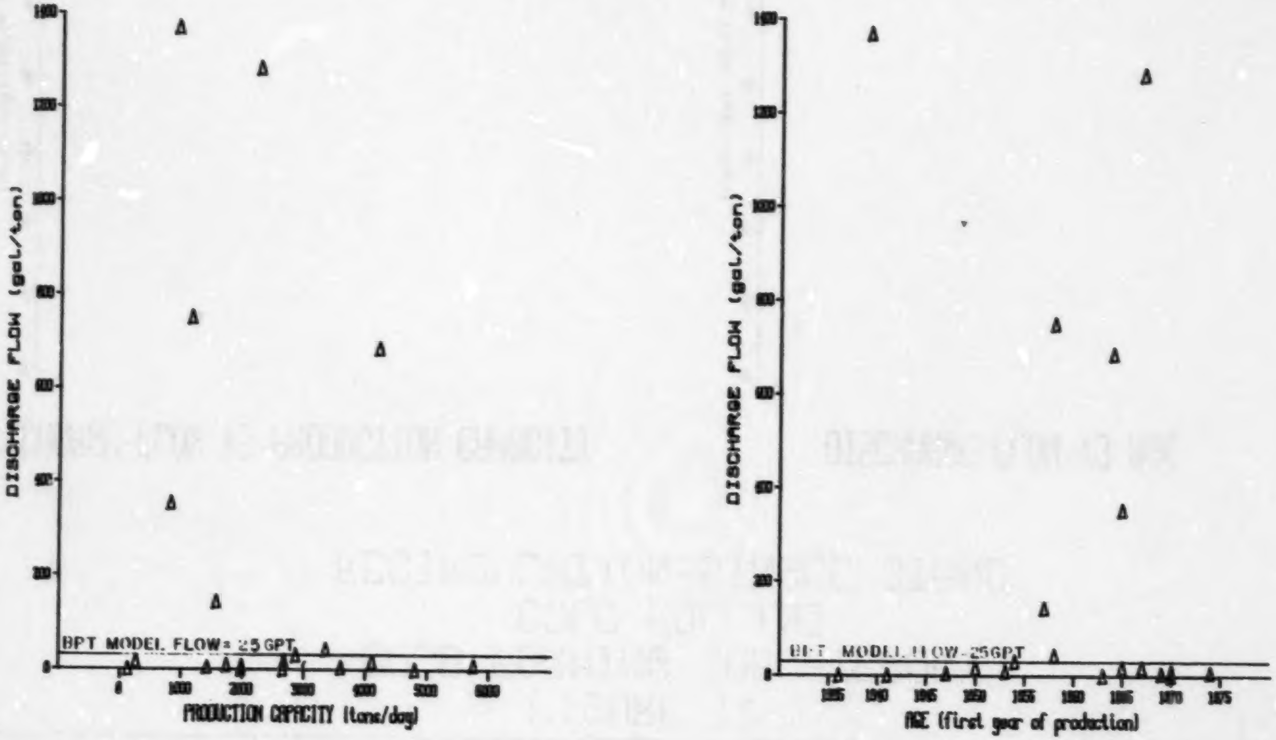
* "Average of the Best" flow (see Section X).

FIGURE IV-1
COLD FORMING SUBCATEGORY
COLD ROLLING
RECIRCULATION-SINGLE STAND


DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

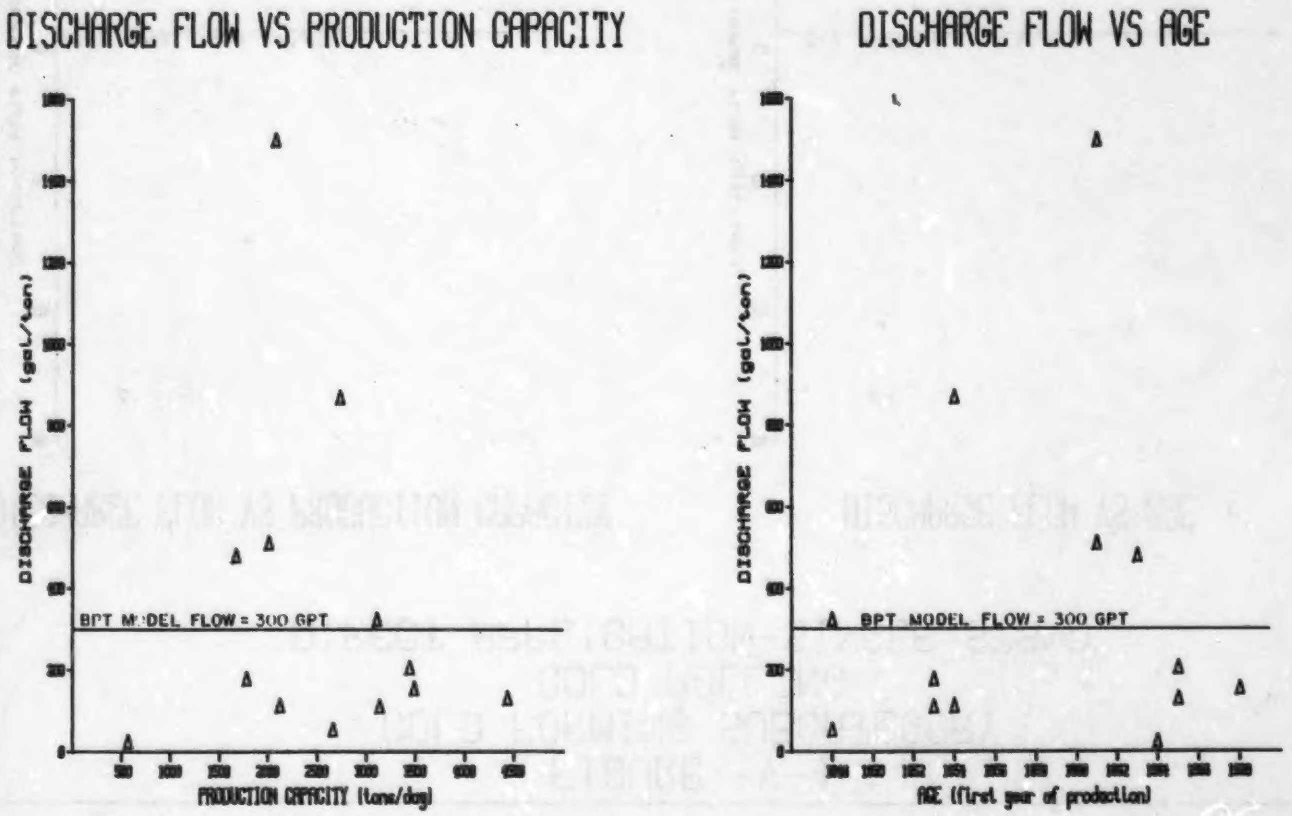
FIGURE IV-2
COLD FORMING SUBCATEGORY
COLD ROLLING
RECIRCULATION-MULTIPLE STAND



DISCHARGE FLOW VS PRODUCTION CAPACITY

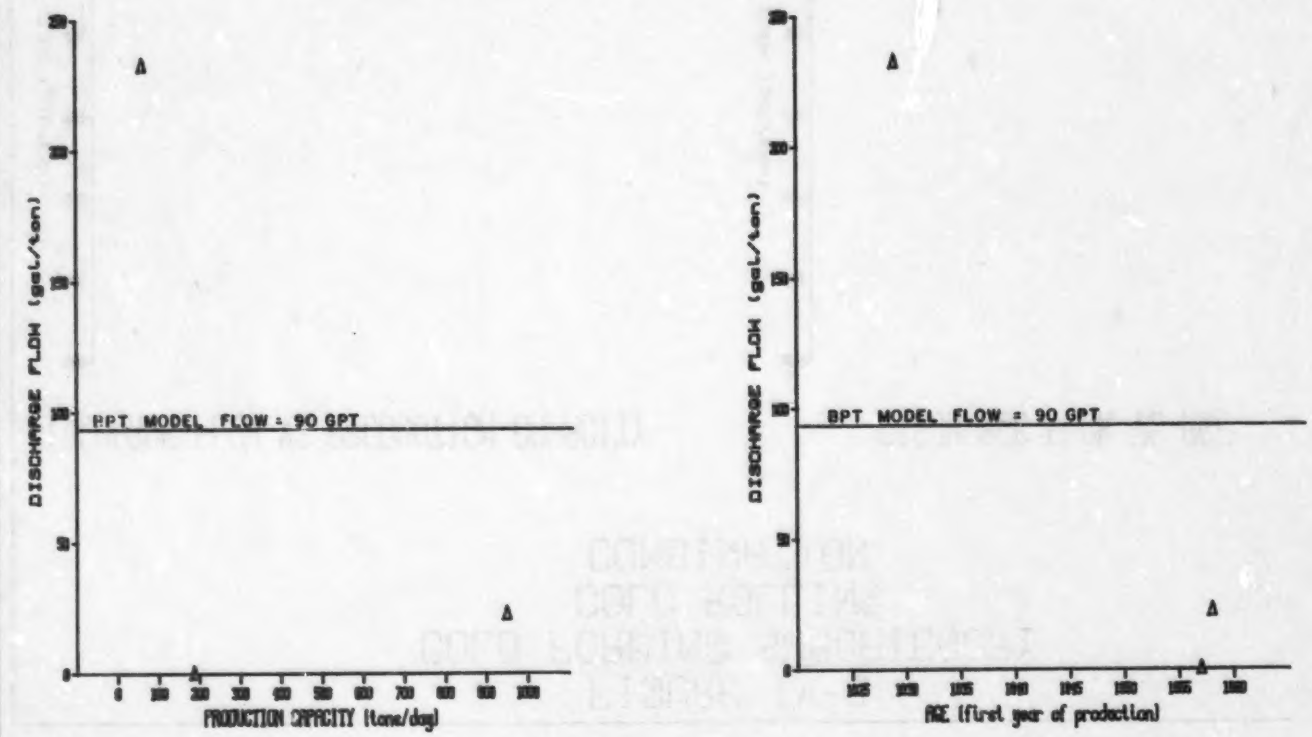
DISCHARGE FLOW VS AGE

FIGURE IV-3
COLD FORMING SUBCATEGORY
COLD ROLLING
COMBINATION


DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

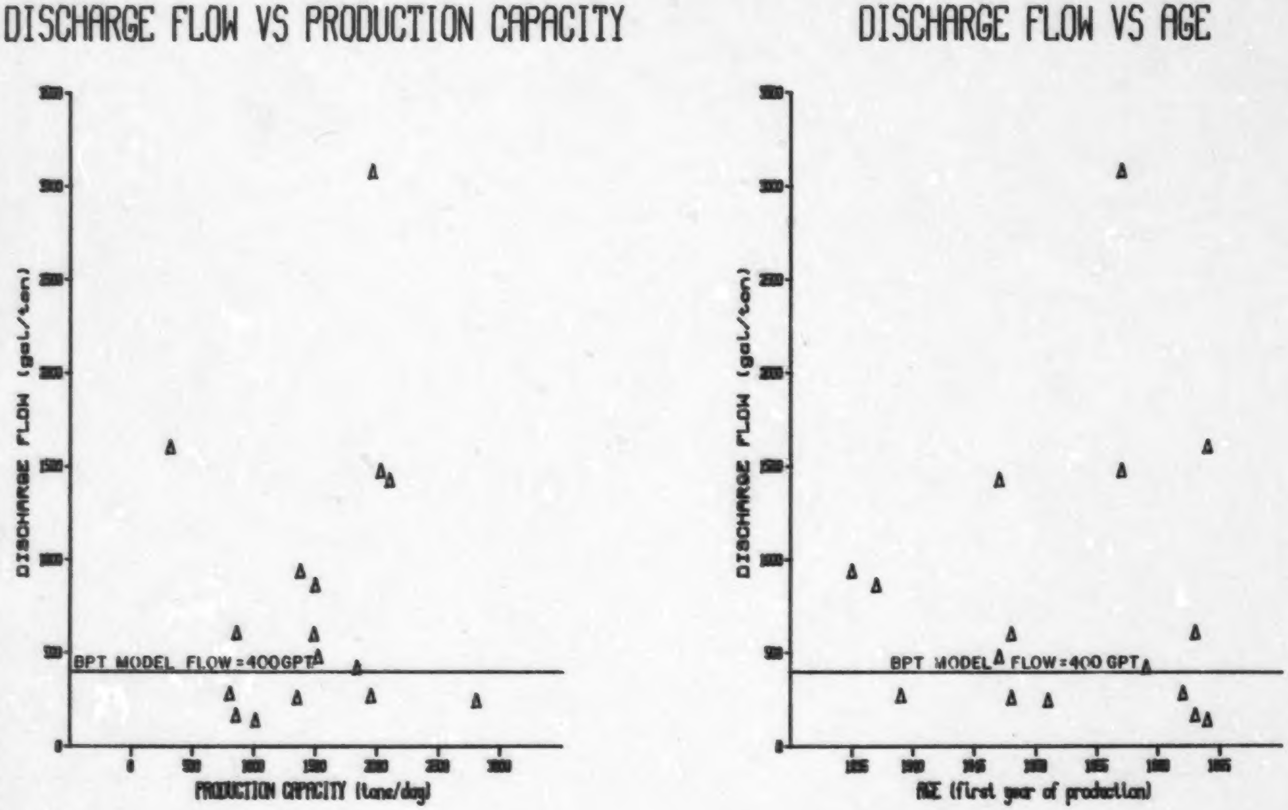
FIGURE IV-4
COLD FORMING SUBCATEGORY
COLD ROLLING
DIRECT APPLICATION-SINGLE STAND



DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

FIGURE IV-5
COLD FORMING SUBCATEGORY
COLD ROLLING
DIRECT APPLICATION-MULTIPLE STAND


DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

SECTION V

COLD FORMING SUBCATEGORY

COLD ROLLING

WATER USE AND WASTEWATER CHARACTERIZATION

Introduction

This section presents a characterization of cold rolling wastewaters. The wastewater characterization is based upon data obtained through three field sampling programs. The wastewaters at 31 cold rolling operations were sampled during the first two surveys, while 52 operations were sampled during the third survey. During the first sampling survey, the Agency investigated the levels of pollutants limited in the 1976 regulation. During the second and third surveys, the Agency expanded the monitoring programs to include sampling for toxic pollutants. Some mills were visited on more than one occasion during the three sampling programs. With a few exceptions, the more recent data were used to characterize the wastewaters from those mills. Where significantly different results were found, or different pollutants were monitored at each visit, the results from both visits are presented.

The water use rates discussed below pertain only to process wastewaters, and do not include noncontact cooling or nonprocess waters. Process wastewater is that water which comes into contact with the process, product, by-product, or raw materials, thus becoming contaminated with pollutants characteristic of the process. Noncontact cooling water is defined as that water used for cooling, which does not directly contact processes, products, raw materials, or by-products. Nonprocess water is defined as that water which is used for nonprocess operations (i.e., utilities).

Description of the Cold Rolling Operation and Wastewater Sources

The major process water use in cold rolling mills is for cooling and lubricating the rolls and the material being rolled. This is accomplished with flooded lubrication systems, where a water-oil emulsion is sprayed directly on the material and rolls. Each stand usually has separate sprays and, where recycle is used, a separate recycle system. Past practice has been the direct sewering of the emulsion. However, the high cost of rolling oils and the implementation of pollution control regulations have modified this practice. Recycle and recovery systems are currently in common use. In fact, most of the recently built cold rolling mills use recirculated oil solution systems to minimize oil usage and pollutant discharges.

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Considerable heat is generated during heavy reductions at high speeds on the various types of mills. The temperatures of both the product and the rolls are raised. This heat is removed by the flooded lubrication system and by noncontact water that is used in the internal roll cooling system. High quality rolling oils are added to form the emulsion sprayed on the rolls. Oil and temperature are the basic pollutants in the discharge. However, the oils become contaminated with solids as they pass over the rolls and the product. Also, the oils themselves can contain high levels of toxic organic pollutants.

Recirculation mills are more common throughout the industry, and in the aggregate, higher tonnages are rolled on these mills. In this operation, the oil emulsion in the flooded lubrication system is collected, treated or conditioned, and recycled to the mill for reapplication to the rolls. Generally, each stand has a separate collection tank or sump and pumps to return the emulsion to the sprays. A five stand tandem mill has five recycle systems, one for each stand. With this arrangement, it is possible to renew one emulsion tank at a time, or all at once. It is also possible to use different oil emulsions in each tank, if the product being rolled so requires. These mills usually have periodic batch discharges of spent rolling emulsions, although a small amount is continuously blown down at some mills to maintain rolling solutions at an acceptable quality. The emulsions in some mills are treated in filters and cooling systems prior to reuse, thereby assuring that the rolling solutions contain minimal amounts of impurities and remain at a fairly uniform temperature. Because of the conservation practices in use and the high degree of recycle, very low wastewater discharge volumes are achieved.

The oils used for cold rolling are frequently changed to either replace the spent emulsion or to meet certain product quality requirements. At some plants, the oils may be changed on a weekly basis, while at others, longer periods of time may elapse between changes. The waste solutions are usually collected in storage tanks and bled into the wastewater treatment system or sold to outside contractors for disposal or reclamation.

During the oil change it is common practice to clean the oil system before a fresh oil solution is added. Solvents containing chlorinated organic compounds, e.g., tetrachloroethylene and trichloroethylene, are commonly used as cleaning solutions. The cleaning solution is also usually discharged to the wastewater treatment system.

The Agency sampled the oil solutions, raw wastes, and treated and partially treated effluents at several cold rolling operations. The resulting data demonstrate widespread contamination of oil solutions and effluents by toxic organic pollutants. Thirty different toxic organics were found at varying levels at the operations sampled. These data clearly demonstrate the widespread nature and diversity of toxic organic pollutant contamination and the need for control of these pollutants.

Flow data and net concentrations of pollutants (net over water supply) found at the recirculation operations surveyed for this study are summarized in Tables V-1 and V-2. Net concentrations are presented to better describe the actual levels of pollutants contributed by the rolling operations. For certain plants the gross values are shown, since data on the makeup water flow rates were not available. The pollutants are nevertheless representative of the contributions from the operation. The water supply is known not to contain these pollutants at levels comparable to those found in these wastewaters. As shown in Section VII, the water supply has little or no effect on these pollutants. Averages are also presented to show the typical level of pollutants that can be expected to be found in a discharge from a recirculation cold rolling mill.

The second type of cold rolling operation is the combination mill, which is, as the name implies, a combination of recirculation and direct application rolling stands. These cold mills are multi-stand, with the last stand usually being the direct application stand. Although the applied flow rates are higher than for the other types of mills, the discharge flow rates in gallons/ton for combination mills are substantially less than for direct application mills because of the recirculation system. Flow and net concentration data for the combination mills surveyed are summarized in Tables V-3 and V-4.

The third type of cold rolling operation is the direct application mill. In these mills, fresh rolling solutions are continuously applied to the rolls or product. Treatment plants and palm oil recovery systems are usually installed to reclaim these oils for reprocessing and potential reuse. The high cost of rolling oils has discouraged the use of once-through systems. Once-through systems are used only when a high quality product is desired, which requires the application of a solution that is free of contamination. These mills have the highest discharge flow rates of any of the cold rolling operations. Flow data and net concentration data for the direct application mills sampled for this study are presented in Table V-5.

Regardless of the type of oil application systems used, miscellaneous oil leaks and spills can occur. Low volume, oil-bearing wastewaters originating in maintenance and roll finishing shops can be significant and should be directed to treatment facilities. Oil and water leaks in oil basements can also contribute high oil loads. These sources of wastewater were considered in developing the limitations and standards.

TABLE V-1

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
COLD ROLLING - RECIRCULATION

Net Concentrations of Pollutants in Raw Wastewaters (1)

Plant Code	D	I	P	X-2	BB-2	EE-2	XX-2	
Reference Code	0248B	0432K	0156B	060B-03	060-03	0112D-01	0684I-01	
Sample Point(s)	11	2	26-27	4-7	5-4	1-3	2-1	Average
Flow (gal/ton)	57	0.8	58,280	17.7	16.0	17.4	138	8361
Total Suspended Solids	1.170	NA	NA	90	55	637	260	442
Oil & Grease	3,700	36,000	-	41,100	664	1,180	619	11,890
Dissolved Iron	NA	NA	NA	NA	0.05	NA	NA	0.05
pH	6.8	NA	NA	7.0	8.0	6.9	7.1	6.8-8.0
119 Chromium	0.1	NA	NA	NA	NA	NA	NA	0.1
120 Copper	0.01	NA	NA	NA	NA	NA	NA	0.01
121 Cyanide, Total	0.0	NA	NA	NA	NA	NA	NA	0.0
122 Lead	0.0	NA	NA	NA	NA	NA	NA	0.0
124 Nickel	0.62	NA	NA	NA	NA	NA	NA	0.62
128 Zinc	0.03	NA	NA	NA	NA	NA	NA	0.03

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(1) All values are in mg/l unless otherwise noted.

NA: Not analyzed

TABLE V-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION

Net Concentration of Pollutants in Raw Wastewater(1)

	Plant Code:	101	102	105	301	302	304A	305B	306	307	308	310
	Reference No.:	020B&C	384A(02,03)	584F(02,03,05)	020B&C	060F	176(08)	176(08)	248B(03)	248B	320	432C
	Sample Point(s):	B-A	E-A	E-A	B-A	A-C(2)	B-A	B(3)	B-A	B-A	B-A	A(3)
	Flow (gal/ton):	4.5	49	1.1	11.0	0.054	0.9	0.029	3.5	4.2	2.5	0.18
	Total Suspended Solids	2220	536	4910	164	NA	528	NA	1402	NA	NA	NA
	Oil & Grease	82,205	1076	37,200	2499	NA	36,000	NA	(4)	NA	NA	NA
	Dissolved Iron	33.6	4.6	5.6	NA	NA	NA	NA	NA	NA	NA	NA
	pH (units)	6.5	6.7	5.8	2.3-4.5	NA	7.5	NA	6.8-7.9	NA	NA	NA
001	Acenaphthene	ND	ND	ND	ND	ND	ND	NA	ND	ND	0.82	NA
004	Benzene	-	-	0.03	0.0	ND	0.0	NA	0.009	ND	ND	NA
006	Carbon Tetrachloride	0.11	ND	ND	ND	ND	ND	NA	ND	ND	ND	NA
011	1,1,1-Trichloroethane	0.42	0.02	ND	0.10	ND	0.0	NA	0.04	ND	ND	NA
013	1,1-Dichloroethane	ND	ND	ND	0.16	ND	0.0	NA	ND	ND	ND	NA
023	Chloroform	0.08	0.01	0.5	0.0	ND	0.0	NA	-	-	ND	NA
024	2-Chlorophenol	35.5	0.02	ND	ND	ND	ND	NA	ND	ND	ND	NA
034	2,4-Dimethylphenol	25.0	0.06	ND	ND	ND	ND	NA	ND	ND	ND	NA
038	Ethylbenzene	0.39	0.005	ND	ND	ND	0.0	NA	0.0	ND	ND	NA
039	Flouranthene	-	-	ND	ND	ND	ND	NA	0.0	0.10	1.88	NA
044	Methylene Chloride	-	-	NR	0.0	ND	0.0	NA	0.021	ND	1.50	NA
055	Napthalene	ND	-	ND	0.54	ND	ND	NA	ND	0.18	0.0	NA
057	2-Nitrophenol	70.0	0.06	ND	ND	ND	ND	NA	ND	ND	ND	NA
059	2,4-Dinitrophenol	ND	0.02	ND	ND	ND	ND	NA	ND	ND	ND	NA
060	4,6-Dinitro-o-cresol	-	0.9	ND	ND	ND	ND	NA	ND	ND	ND	NA
064	Pentachlorophenol	ND	0.04	ND	ND	ND	ND	NA	ND	ND	ND	NA
065	Phenol	ND	0.07	-	0.09	ND	ND	NA	ND	ND	ND	NA
066	Bis (2-ethyl hexyl) phthalate	0.2	0.8	0	-	ND	ND	NA	0.08	ND	ND	NA
068	Di-n-butyl phthalate	0.04	0.05	-	-	ND	ND	NA	0.0	ND	ND	NA
069	Di-n-octyl phthalate	0.1	0.05	ND	-	ND	ND	NA	-	ND	ND	NA
070	Di-ethyl phthalate	0.008	0.02	ND	ND	ND	ND	NA	ND	ND	ND	NA
071	Di-methyl phthalate	0.1	0.1	ND	ND	ND	ND	NA	ND	ND	ND	NA
072	Benzo-a-anthracene	-	ND	ND	ND	ND	ND	NA	0.0	ND	2.40	NA
076	Chrysene	ND	ND	-	ND	ND	ND	NA	0.0	0.10	1.50	NA

TABLE V-2
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION
PAGE 2

Plant Code:	101	102	105	301	302	304A	305B	306	307	308	310
Reference No.:	020B&C	384A(02,03)	584F(02,03,05)	020B&C	060E	176(08)	176(08)	248B(03)	248B	320	432C
Sample Point(s):	B-A	E-A	E-A	B-A	A-C(2)	B-A	B(3)	B-A	B-A	B-A	A(3)
Flow (gal/ton):	4.5	49	1.1	11.0	0.054	0.9	0.029	3.5	4.2	2.5	0.18
077 Acenaphthylene	ND	ND	ND	ND	ND	ND	NA	0.0	ND	2.05	NA
078 Anthracene	ND	ND	ND	ND	ND	14	NA	ND	0.060	ND	NA
080 Fluorene	0.0	0.02	ND	0.2	ND	ND	NA	ND	ND	3.55	NA
081 Phenanthrene	ND	ND	ND	ND	ND	14	NA	0.0	0.87	3.90	NA
084 Pyrene	-	-	ND	ND	ND	ND	NA	0.0	0.84	2.20	NA
085 Tetrachloroethylene	1.2	0.005	ND	0.06	ND	ND	NA	ND	ND	ND	NA
086 Toluene	0.1	ND	0.06	0.2	ND	0.0	NA	0.04	ND	ND	NA
087 Trichloroethylene	0.02	-	-	0.1	ND	ND	NA	0.03	-	ND	NA
114 Antimony	0.1	0.0	0.11	0.006	NA	0.12	NA	0.013	NA	NA	NA
115 Arsenic	NA	NA	0.58	0.4	NA	0.06	NA	0.0	NA	NA	NA
117 Beryllium	NA	NA	0.02	0.004	NA	0.003	NA	0.0	NA	NA	NA
118 Cadmium	0.03	0.0	0.35	0.031	NA	0.0	NA	0.04	NA	NA	NA
119 Chromium	6.5	0.06	-	1.1	NA	10.4	NA	3.1	NA	NA	NA
120 Copper	7.3	0.70	2.0	3.6	NA	28.3	NA	7.4	NA	NA	NA
121 Cyanide, Total	0.01	0.032	-	0.0	NA	NA	NA	0.0	NA	NA	NA
122 Lead	1.5	0.20	2.5	0.53	NA	0.54	NA	10.4	NA	NA	NA
124 Nickel	NA	0.22	1.0	1.6	NA	11.5	NA	4.5	NA	NA	NA
126 Silver	0.005	0.0	0.0	0.0	NA	0.0	NA	0.007	NA	NA	NA
128 Zinc	1.7	0.18	0.48	7.9	NA	9.5	NA	3.7	NA	NA	NA
130 Xylene	4.3	0.005	ND	NA	NA	NA	NA	NA	NA	NA	NA

TABLE V-2
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION
PAGE 3

	Plant Code:	315A	315B	316	318	321A	321B	321C	
	Reference No.:	684F(02)	684F(03)	684B	856P	684D	684D	684D	
	Sample Point(s):	A(3)	B(3)	A(3)	A(3)	A(3)	E(3)	F(3)	Average(7)
	Flow (gal/ton):	8.7(5)	4.3(5)	144	0.8(5)	10(6)	10(6)	10(6)	18
	Total Suspended Solids	NA	NA	NA	NA	NA	NA	NA	1508
	Oil & Grease	NA	NA	NA	NA	NA	NA	NA	19,194
	Dissolved Iron	NA	NA	NA	NA	NA	NA	NA	5.1
	pH	NA	NA	NA	NA	NA	NA	NA	2.3-7.9
001	Acenaphthene								0.12
004	Benzene	NA	NA	NA	NA	NA	NA	NA	0.004
006	Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	ND
011	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	0.017
013	1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	0.023
023	Chloroform	NA	NA	NA	NA	NA	NA	NA	0.073
024	2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	0.003
034	2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	0.009
038	Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	0.001
039	Flouranthene	NA	NA	NA	NA	NA	NA	NA	0.28
044	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	0.21
055	Napthalene	NA	NA	NA	NA	NA	NA	NA	0.10
057	2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	0.009
059	2,4-Dinitro-o-cresol	NA	NA	NA	NA	NA	NA	NA	0.003
060	4,6-Dinitro-o-cresol	NA	NA	NA	NA	NA	NA	NA	0.13
069	Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	0.006
065	Phenol	NA	NA	NA	NA	NA	NA	NA	0.023
066	Bis (2-ethyl hexyl) phthalate	NA	NA	NA	NA	NA	NA	NA	0.11
068	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	0.007
069	Di-n-octyl phthalate	NA	NA	NA	NA	NA	NA	NA	0.007
070	Di-ethyl phthalate	NA	NA	NA	NA	NA	NA	NA	0.003
071	Di-methyl phthalate	NA	NA	NA	NA	NA	NA	NA	0.014
072	Benzo-a-anthracene	NA	NA	NA	NA	NA	NA	NA	0.34
076	Chrysene	NA	NA	NA	NA	NA	NA	NA	0.23

TABLE V-2
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION
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Plant Code:	315A	315B	316	318	321A	321B	321C	
Reference No.:	684F(02)	684F(03)	684B	856P	684D	684D	684D	
Sample Point(s):	A(3)	B(3)	A(3)	A(3)	A(3)	F(3)	F(3)	Average(7)
Flow (gal/ton):	8.7(5)	4.3(5)	144	0.8(5)	10(6)	10(6)	10(6)	18
077 Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	0.29
078 Anthracene	NA	NA	NA	NA	NA	NA	NA	2.0
080 Fluorene	NA	NA	NA	NA	NA	NA	NA	0.54
081 Phenanthrene	NA	NA	NA	NA	NA	NA	NA	2.7
084 Pyrene	NA	NA	NA	NA	NA	NA	NA	0.43
085 Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	0.009
086 Toluene	NA	NA	NA	NA	NA	NA	NA	0.037
087 Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	0.014
114 Antimony	NA	NA	NA	NA	NA	NA	NA	0.050
115 Arsenic	NA	NA	NA	NA	NA	NA	NA	0.26
117 Beryllium	NA	NA	NA	NA	NA	NA	NA	0.007
118 Cadmium	NA	NA	NA	NA	NA	NA	NA	0.084
119 Chromium	NA	NA	NA	NA	NA	NA	NA	2.9
120 Copper	NA	NA	NA	NA	NA	NA	NA	8.4
121 Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	0.008
122 Lead	NA	NA	NA	NA	NA	NA	NA	2.8
124 Nickel	NA	NA	NA	NA	NA	NA	NA	3.8
126 Silver	NA	NA	NA	NA	NA	NA	NA	0.001
128 Zinc	NA	NA	NA	NA	NA	NA	NA	4.4
130 Xylene	NA	NA	NA	NA	NA	NA	NA	0.003

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(1) All values are in mg/l unless otherwise noted.
(2) The data for sample point C is not available. However, no organics were detected at A so that any net calculation would have resulted in a negative value.
(3) A sample of the raw water was not obtained during the sampling visit. The net calculation, therefore can not be performed.
(4) The sample could not be analyzed for oil and grease due to the formation of a heavy oil emulsion.
(5) The flow data is derived from the basic questionnaire since flow information is not available in the sampling visit report.
(6) This flow value represents the total flow for all three mills (321 A,B and C).
(7) The averages do not include any data from Plant 101 since it was later resampled as Plant 306 is not included in the averages since it was also later resampled as Plant 307.

- : Calculation yielded a negative result.
NA: Not analyzed
ND: Not detected

TABLE V-3

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
COLD ROLLING - COMBINATION

Net Concentration of Pollutants in Raw Wastewaters[1]

Plant Code	DD-2
Reference Code	584E-01
Sample Point	1
Flow (gal/ton)	512
Total Suspended Solids	987
Oil & Grease	1,399
Dissolved Iron	7.8
pH	5.7

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(1) All values are in mg/l unless otherwise noted.

TABLE V-4

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - COMBINATION

Net concentration of Pollutants in Raw Wastewater(1)

	311	312A	312B	313A	319	320A	
Plant Code:	311	312A	312B	313A	319	320A	
Reference No.:	432D	948C(04)	948C(02)	584B	856F(01)	860B(03)	
Sample Point(s):	B(2)	A(2)	C(2)	A(2)	D-B	B	Average
Flow (gal/ton):	156	1500	207	55	112	1.02	339
Total Suspended Solids	NA	NA	NA	NA	699	NA	699
Oil & Grease	NA	NA	NA	NA	1558	NA	1558
Dissolved Iron	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	6.6	NA	6.6
039 Fluoranthene	ND	ND	0.50	ND	ND	ND	0.083
044 Methylene Chloride	NA	NA	9.1	NA	ND	ND	3.0
055 Naphthalene	ND	ND	ND	ND	ND	24	4
066 Bis (2-ethyl hexyl)phthalate	ND	ND	ND	ND	0.008	ND	0.001
078 Anthracene	ND	ND	1.05	ND	ND	ND	0.18
080 Fluorene	ND	ND	ND	ND	ND	5.9	0.98
081 Phenanthrene	ND	2.2	2.40	ND	ND	26.2	5.1
084 Pyrene	ND	ND	0.30	ND	ND	ND	0.05
087 Trichloroethylene	ND	0.012	ND	ND	ND	ND	0.002
115 Arsenic	NA	NA	NA	NA	0.16	NA	0.16
119 Chromium	NA	NA	NA	NA	0.03	NA	0.03
120 Copper	NA	NA	NA	NA	0.89	NA	0.89
124 Nickel	NA	NA	NA	NA	0.21	NA	0.21
128 Zinc	NA	NA	NA	NA	0.15	NA	0.15

---

(1) All values are in mg/l unless otherwise noted.
(2) A sample of the raw water could not be obtained. A net calculation therefore can not be performed. The values shown are gross values.

ND: Not detected
NA: Not analyzed

TABLE V-5

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - DIRECT APPLICATION

Net Concentrations of Pollutants in Raw Wastewaters(1)

	Plant Code	105	106	304B(2)	305A	313B
	Reference Code	584F-(04)	112B-(01&03-06)	176-(02)	176-(02)	584A-(02)
	Sample Points	D-A	B-A	C-A	C-A(3)	C(4)
	Flow (gal/ton)	424	670	233	52,920	73(3)	Average 442
	Total Suspended Solids	160	73	14.3	NA	NA	82
	Oil & Grease	1,861	1,600	173	NA	NA	1,211
	Dissolved Iron	22.3	NA	NA	NA	NA	22.3
	pH	7.2	6.5-9.0	6.8-7.7	NA	NA	6.5-9.0
004	Benzene	0.01	ND	0.0	ND	ND	0.003
006	Carbon Tetrachloride	0.03	ND	ND	ND	ND	0.008
011	1,1,1-Trichloroethane	0.14	0.0	0.0	0.032	ND	0.035
038	Ethylbenzene	ND	ND	ND	ND	0.060	0.015
044	Methylene Chloride	2.40	0.0	0.005	ND	ND	0.60
055	Naphthalene	ND	0.0	ND	ND	17.5	4.4
066	Bis(2-ethylhexyl) phthalate	1.18	ND	ND	ND	ND	0.30
068	Di-n-butyl phthalate	1.00	ND	ND	ND	ND	0.25
069	Di-n-octyl phthalate	0.30	ND	ND	ND	ND	0.075
078	Anthracene	ND	ND	0.055	ND	ND	0.014
081	Phenanthrene	ND	0.0	0.055	ND	ND	0.014
085	Tetrachloroethylene	0.08	ND	ND	ND	ND	0.020
086	Toluene	ND	0.0	0.0	ND	0.275	0.069
115	Arsenic	0.029	0.02	0.0	NA	NA	0.016
117	Beryllium	0.0	0.0	0.009	NA	NA	0.003
119	Chromium	-	-	0.12	NA	NA	0.040
120	Copper	0.001	0.2	0.049	NA	NA	0.083
122	Lead	0.0	0.0	0.73	NA	NA	0.24
124	Nickel	0.0	0.0	0.55	NA	NA	0.18
126	Silver	0.0	0.0	0.0	NA	NA	0.0
128	Zinc	-	0.084	0.03	NA	NA	0.038

NA : Not analyzed
ND : Not detected
(-): Negative value. Counted as zero in average calculations.

(1) All values are in mg/l unless otherwise noted.
(2) The toxic organics data for Plant 304B is not included in the averages since it was also later resampled as Plant 305A.
(3) Data for sample point A was taken from Plant 304B, since no sample of city water was collected during the Plant 305A visit.
(4) A sample of the raw water could not be obtained. A net calculation therefore cannot be performed. The values shown are gross values.
(5) Flow includes wastes from other sources and therefore is not included in the average.

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION VI

WASTEWATER POLLUTANTS

Introduction

The final selection of pollutants to be limited for the cold rolling subdivision is based primarily upon the results of the three monitoring programs described in Section V. The pollutants found in the first guidelines surveys were confirmed and augmented with more extensive monitoring data that included analyses for toxic pollutants. This section describes the pollutants chosen, and the rationale for selecting those pollutants.

Conventional and Nonconventional Pollutants

In the previous regulation, four pollutants were limited: total suspended solids, oil and grease, dissolved iron and pH. Suspended solids, oil and grease and pH were limited at all cold rolling mills. However, dissolved iron was limited only when cold rolling wastewaters were treated in combination with acid pickling wastewaters.

Two of these pollutants, oil and grease and suspended solids, are characteristic of the cold mill wastewaters. Both originate in the oil solutions that are sprayed on the rolling stands. Oils in significant levels (up to 40,000 mg/l) are contained in untreated wastewaters. Suspended solids are also present in cold rolling wastewaters in high levels, with concentrations of 1000 mg/l common at many mills. The suspended solids also originate in the oil solutions, as the oils pass over the stands and product and pick up small scale particles or dirt from the product surface. In recirculation mills, the solid levels are usually higher than for other mills because of the buildup that can occur as the oil solutions are recirculated. Dissolved iron may also be present in cold rolling wastewaters, but generally at low levels. Also, dissolved iron is no longer limited in the acid pickling subcategory. For these reasons and the fact that toxic metals are limited in this subdivision (see discussion below), the Agency has decided not to limit dissolved iron in the cold rolling subdivision.

Limitations for pH were included in the original regulation and are included in this regulation. Although the pH of raw cold mill wastewaters is often within the range of 6 to 9 standard units, a limitation has been promulgated to ensure that the pH remains in this range after treatment. Most cold mill treatment systems include acid addition for treatment of the oily wastewaters, which reduces the pH

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to the 4-5 range. The pH limit ensures that proper neutralization is carried out prior to discharge.

Toxic Pollutants

Table VI-1 is a list of the toxic pollutants found in cold rolling wastewaters, from surveys conducted by the Agency or reported by the industry in D-DCPs. The net concentration of each pollutant was calculated, and those that were found at average concentrations greater than 0.010 mg/l are considered to be characteristic of cold mill wastewaters. Table VI-2 presents a list of those toxic pollutants. It is important to note that net concentrations were used only to characterize the pollutants generated in the cold mill process. All effluent limitations were developed on a gross basis taking into account the treatability of each pollutant.

Some pollutants were detected at concentrations greater than 0.010 mg/l but are not listed in Table VI-2. The Agency believes the presence of those compounds is not due to the cold rolling operation. Methylene chloride was omitted, because this compound is commonly used as a cleaning agent in the laboratory, and the Agency attributes its detection to this practice and not to the cold mills sampled. Also, the phthalate compounds are not believed to be characteristic of cold mill wastewaters. The Agency attributes their presence to plasticizers in the tubing used with automatic samplers for the Agency's surveys.

As noted in Table VI-2, many toxic organic and inorganic pollutants were detected in wastewaters from cold rolling operations. The major sources of these pollutants are the rolling oils and cleaning solutions used at the mills. The exact nature of these oils are often proprietary, making it difficult to relate any of the pollutants to any one type of oil or brand name.

The Agency did not promulgate effluent limitations and standards for each of the toxic pollutants listed in Table VI-2. Lead and zinc were selected as indicator pollutants for other toxic metals found in carbon steel cold rolling wastewaters, while chromium and nickel were selected as indicator pollutants for toxic metals found in specialty steel cold rolling wastewaters. Since naphthalene and tetrachloroethylene are common to most cold rolling and cleaning solutions, respectively, the Agency developed limitations and standards for these toxic organic pollutants. However, because of wide variations in the occurence of other toxic organic pollutants, the Agency has concluded that it is not feasible to develop national limitations and standards for all toxic organic pollutants found in cold rolling wastewaters. Instead, it believes that the specific toxic organic pollutants found at each plant should be limited on a case-by-case basis. The Agency believes that the use of the selected indicator pollutants will result in comparable control of the other toxic pollutants and in reasonable monitoring programs for the industry.

TABLE VI-1

TOXIC POLLUTANTS KNOWN TO BE PRESENT
COLD ROLLING

4. Benzene
6. Carbon Tetrachloride
11. 1,1,1-Trichloroethane
13. 1,1-Dichloroethane
23. Chloroform
24. Chlorophenol
34. 2,4-Dimethylphenol
38. Ethylbenzene
44. Methylene Chloride
57. 2-Nitrophenol
59. 2,4-Dinitrophenol
60. 4,6-Dinitro-o-cresol
64. Pentachlorophenol
65. Phenol
66. Bis(2-ethylhexyl) phthalate
67. Butyl benzyl phthalate
68. Di-n-octyl phthalate
69. Di-n-octyl phthalate
70. Diethyl phthalate
71. Dimethyl phthalate
78. Anthracene
80. Fluorene
85. Tetrachloroethylene
86. Toluene
87. Trichloroethylene
114. Antimony
115. Arsenic
117. Beryllium
118. Cadmium
119. Chromium
120. Copper
121. Cyanide
122. Lead
124. Nickel
126. Silver
128. Zinc
130. Xylene

TABLE VI-2

SELECTED POLLUTANTS
COLD ROLLING

Recirculation

	Total Suspended Solids
	Oil and Grease
	pH
001	Acenaphthene
011	1,1,1-Trichloroethane
013	1,1-Dichloroethane
023	Chloroform
039	Fluoranthene
055	Napthalene
060	4,6-Dinitro-o-cresol
065	Phenol
072	Benzo-a-anthracene
076	Chrysene
077	Acenaphthylene
078	Anthracene
080	Fluorene
081	Phenanthrene
084	Pyrene
085	Tetrachloroethylene
086	Toluene
087	Trichloroethylene
114	Antimony
115	Arsenic
118	Cadmium
119	Chromium
120	Copper
122	Lead
124	Nickel
128	Zinc

Combination

	Total Suspended Solids
	Oil and Grease
	pH
039	Fluoranthene
055	Napthalene
078	Anthracene
080	Fluorene
081	Phenanthrene
084	Pyrene
115	Arsenic
119	Chromium
120	Copper
124	Nickel
128	Zinc

Direct Application

	Total Suspended Solids
	Oil and Grease
	pH
006	Carbon Tetrachloride
011	1,1,1-Trichloroethane
055	Naphthalene
078	Anthracene
085	Tetrachloroethylene
086	Toluene
115	Arsenic
117	Beryllium
119	Chromium
120	Copper
122	Lead
124	Nickel
128	Zinc

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

Introduction

A review of the control and treatment technologies currently in use or available for use in the cold rolling subdivision provided the basis for the selection and development of BPT, BAT, NSPS, PSES, and PSNS alternative treatment systems. The Agency reviewed the DCP responses and plant visit data to identify those treatment components and systems in use at cold rolling operations. Performance of these treatment systems, demonstrated in this or in other operations (refer to Volume I) were used in evaluating the various treatment technologies. This section presents a summary of the treatment practices currently in use or available for treatment of cold rolling wastewaters.

This section also presents the raw wastewater and treated effluent data for the plants sampled and the long-term effluent data provided in responses to the D-DCPs. Also included are descriptions of the treatment systems installed at each of the sampled plants and an analysis of the impact of makeup waters on raw wastewater pollutant loadings.

Summary of Treatment Practices in Use

Since the characteristics of wastewaters generated in the three types of cold rolling mills are similar, the same treatment is employed regardless of the oil application system used. The same treatment system may be used to treat wastewaters only from recirculation mills or it may be used to treat a combined wastewater from direct application, combination, and recirculation mills. Varying degrees of recovery and reuse of oil emulsions is practiced. While this may affect the raw concentration of pollutants in the discharge, it does not have a significant effect on the treatment components selected. Depending upon the extent of recycle or reuse practiced, the treatment systems may be sized differently.

All treatment systems for cold rolling mills include physical/chemical controls. Also, wastewaters from over 95% of all cold rolling mills are treated in central treatment systems (i.e., other wastewaters are combined with cold rolling wastewaters prior to treatment). As with many other forming and finishing operations, this often complicates the analysis of the effluent data for the sampled mills, because the high strength cold mill wastewaters are sometimes diluted in large central treatment systems.

Because of the predominance of central treatment systems, the data for this subcategory and others were analyzed to determine the effect of central treatment systems on the ability to achieve the same level of treatment achieved through separate treatment of cold rolling wastewaters. This analysis demonstrated that similar flow rates and effluent levels are achievable with both types of treatment systems, provided that adequate pretreatment of the cold rolling wastewaters is practiced. Therefore, the Agency did not differentiate between separate and central treatment. All treatment models shown in this document reflect "stand-alone" systems, which can be integrated into central treatment plants. Due to the nature of cold rolling wastewaters, the Agency believes that these wastewaters should be pretreated for the removal of oil and grease and toxic organic pollutants prior to mixing with other wastewaters in central treatment plants.

Additionally, wastewaters from many plants are collected and hauled off-site for disposal or reclamation by contractors. Thirteen recirculation mills have achieved no discharge of process wastewaters through this method. Besides direct discharge mills, there are ten mills that have only limited pretreatment and discharge to locally owned public treatment works.

A summary of control and treatment technology currently practiced at cold rolling mills follows:

1. The first level of pollutant control for recirculation and combination mills is oil solution reuse. This practice results in great cost savings and also results in significant reductions in flow and pollutant loads discharged from the operations. The average recirculation rate of rolling solutions for the mills surveyed is 94.4% with a range of 58.4% to 100%.

2. Several options exist for treatment of cold rolling wasters. All are physical/chemical in nature. The pollutants in the wastewaters from cold rolling operations are usually treated in separate unit operations. These systems are summarized below by the pollutant removed.

   a. Oils and Greases

   Oils and greases present in cold rolling wastewaters can either be emulsified or nonemulsified. The characteristics of emulsified oils vary widely, depending on the types of oils used in the rolling solutions. Floating or free oils resulting from mechanical lubrication systems are not found in quantities as high as the emulsified oils.

   If all the oils and greases are nonemulsified, as at some of the direct application mills surveyed, oil skimming can be used for oil treatment. These wastewaters are discharged through a tank or basin of sufficient size and design to allow the oil to separate and rise to the surface. At the surface, the oil is contained by underflow baffles and skimmed.

However, if the wastewaters contain emulsified oils, chemical treatment is required to separate the oils from solution prior to other treatment steps. Either acid pickling rinsewater or purchased acid is added to the oily cold rolling wastewaters in a mixing tank at a pH of 4-5 to chemically break the oil emulsions. Once the emulsions are "broken", coagulant or flotation aids such as alum and polyelectrolytes may be added. The wastewaters are then neutralized and passed through dissolved air flotation or similar oil removal systems, where oils are separated from the wastewater. Another alternative used for oil removal is sedimentation and skimming after emulsion breaking.

Dissolved air (gas) flotation is used to separate the oils and other suspended solids and low density material from the wastewaters. In this process, the wastewater is saturated with gases (air), pressurized and subsequently introduced into the flotation tank at atmospheric pressure. The dissolved gases are released from solution and form fine gas bubbles. These gas bubbles attach to the oily and other suspended material. This increases the buoyancy of the material, thus enhancing separation by flotation. The floating material is skimmed from the surface.

b. Total Suspended Solids

Moderate levels of suspended solids are generated in cold rolling operations. These solids are picked up on the rolls and carried from the process in the oil-water emulsions. Suspended solids removal, in most cases, is carried out in clarifiers or in lagoons after the addition of lime and polymer in mixing tanks. These chemicals promote settling and neutralize the wastewaters. Also, suspended solids are removed by the oil removal systems, as some solids cling to the oil particles and are removed by the skimmers and air flotation devices.

An alternative method used at a small number of mills to remove suspended solids and oil is ultra-high rate (UHR) filtration. Primary settling and skimming is done prior to filtration to reduce the levels of floating oils and heavy solids. Polyelectrolyte addition prior to the filter is sometimes used to improve filter effluent quality and also to facilitate filter backwashing. Clogging of the filter is minimized by adding steam to the backwash cycle in addition to air and water. The UHR filter is highly effective in reducing solids and oils and can be installed in much smaller areas than conventional settling basins.

3. Plants which discharge to publicly owned treatment works usually have an intermediate level of treatment. Most have primary settling and oil skimming to reduce the loadings of suspended solids and oils entering POTWs. An ultrafiltration system is used at one plant for pretreatment.

4. Waste oil solutions are collected and hauled off-site for a large number of plants with small waste volumes. Surface oil skimming prior to disposal is practiced at some mills for recovery of a portion of the used oil.

Control and Treatment Technologies Considered for Toxic Pollutant Removal

Because toxic metal and toxic organic pollutants have been detected above treatability levels in the discharges from cold rolling operations, the Agency considered advanced levels of treatment for BAT, NSPS, PSES, and PSNS.

Methods available to effectively reduce the levels of the toxic metal pollutants in cold rolling wastewaters include filtration, chemical precipitation, and others as noted in Volume I.

Thirty toxic organic pollutants were found in the wastewaters from cold rolling mills. These pollutants originate in the oil and cleaning solutions used. Toxic organic pollutants were found in the wastewaters from each type of cold rolling operation at varying levels. As a result, the Agency investigated alternative treatment technologies for the removal of toxic organic pollutants.

The treatment alternatives that were considered for cold rolling wastewaters are discussed below. Although only one of these systems has been demonstrated within the cold rolling subdivision, they all have been demonstrated in other industrial applications on wastewaters with characteristics similar to those of cold rolling wastewaters.

A. Filtration

Filtration is commonly used in the steel industry to remove suspended solids, including particulate toxic metals, and oils. The filters in use in the industry include single and multimedia, and gravity and pressure type systems. All have been demonstrated to be equally effective. As discussed previously, filters are being used to treat cold rolling wastewaters.

Filtration removes suspended solids and oils from the wastewater by a combination of physical and chemical mechanisms, e.g., deposition, entrapment, and other surface and particle interactions. The wastewater is passed through the filter media, where the suspended solids and oils are removed and accumulated. On a periodic basis, depending on pressure drop across the filter or a predetermined timing cycle, the filter is cleaned by backwashing. The water used for backwashing is collected in a sedimentation tank. The sludge underflow from this tank is dewatered and disposed, while the overflow is returned to the filtration system.

B. Processing of Wastewater With Activated Carbon

Activated carbon has been used in several applications for the removal of organic pollutants from wastewaters. It is used to treat wastewaters from cokemaking, petroleum refining, and organic chemical manufacturing. Operational guidelines for the use of activated carbon specify that where the water or wastewater to be processed has significant turbidity, chemical clarification followed by filtration should precede the activated carbon unit. Some industrial applications have chemical precipitation followed by diatomaceous earth filtration to achieve the clarity required for low level removal of organic pollutants. The need for removal of particulates increases where removal of toxic organic pollutants to low levels is required.

The data available for carbon adsorption indicate that most of the toxic organic pollutants found in the discharges from cold rolling mills respond well to carbon adsorption. The data from other applications of this technology indicate that most of the organic pollutants can be treated to levels below 50 micrograms per liter. Reference is made to Volume I for additional information on activated carbon adsorption.

C. Ultrafiltration

Ultrafiltration (UF) techniques are based upon a pressure-driven filtration membrane to separate multicomponent solutes, or solutes from solvents, according to molecular size and shape. Ultrafiltration can be designed to separate the oil emulsion present in many of the discharges from cold rolling operations. At the same time, organic compounds of a certain molecular weight will also be removed. Hence, ultrafiltration could prove to be an effective means of removing organic toxic pollutants from cold rolling wastewaters.

One of the sampled plants, Plant 101, has an ultrafiltration system installed to treat wastewaters from twelve cold rolling mills. The data for this plant (see Table VII-3), show that the ultrafiltration unit is effective in reducing the levels of oil and grease and organic matter. However, one potential disadvantage of this system is that the membrane is selective in the types of pollutants it will remove and can clog easily if free oils or similar pollutants are present. This problem was experienced at Plant 101. Wastewaters from one of the cold mills are now hauled off-site, because the ultrafiltration system is unable to effectively treat the wastewaters from this mill.

Although UF has been demonstrated at Plant 101, this technology has not been used as the basis for the effluent limitations and standards developed for this subcategory. The Agency does not believe that the data available at this time are sufficient for application of UF to the entire cold rolling subcategory.

D. Vapor Compression Distillation

Vapor compression brine concentrators are typically used to concentrate high TDS waters (3,000-10,000 mg/l) to a slurry consistency (approximately 100,000 mg/l). The slurry discharge can be dried in a mechanical drier or allowed to crystallize in a small solar or steam-heated pond prior to final disposal. The distillate quality water generated by this system can be recycled to the process, thereby eliminating the aqueous discharge. One desirable feature of this system is its relative freedom from scaling. Because of a unique design, calcium sulfate and silicate crystals grow in solution as opposed to depositing on heat transfer surfaces. Economic operation of the system requires a high calcium to sodium ratio (hard water).

Due to cost and energy considerations, only limited application is made of vapor compression distillation in processing wastewaters.

Summary of Sampling Visit Data

Recirculation Mills

Fifty-seven recirculation operations were visited during this study, with twelve operations sampled twice. The raw and effluent data gathered for the original guidelines study are summarized in Table VII-2. Table VII-3 presents the raw and effluent data from the toxic pollutant survey. Table VII-1 provides a legend for the various control and treatment technology abbreviations used on the above tables and in other tables throughout this report. A brief description of each wastewater treatment system follows. More details are available on the respective wastewater flow diagrams.

Plant D (0248B-01) - Figure VII-1

Oil skimming is used to remove insoluble oils, and chemical addition is used to break the oil emulsion found in the blowdown coolant from the cold rolling operation.

Plant I (0432K) - Figure VII-2

Oil skimming is used to remove insoluble oils, and a paper filter is used to remove particulate matter before recirculating the coolant to the cold rolling operation. The skimmed oil is reprocessed by an outside firm. There is no other discharge from this system.

Plant P (0156B) - Figure VII-3

The effluent from the mill is filtered removing oils and suspended solids. The filter effluent is recycled to the mill.

Plant X-2 (0060B-03) - Figure VII-4

Treatment at this mill consists of air flotation, chemical treatment, clarification, and plant reuse. The cold mill wastewaters are treated in a central treatment unit together with acid pickling wastewaters.

Plant BB-2 (0060-03) - Figure VII-5

Cold rolling wastes are treated in combination with pickling wastes. Treatment consists of neutralization, aeration, clarification, and lagooning prior to discharge to the receiving stream.

Plant EE-2 (0112D-01) - Figure VII-6

Oil skimming, chemical treatment, and lagooning are provided prior to discharge.

Plant XX-2 (0684I-01) - Figure VII-7

Treatment at this mill consists of primary settling, oil skimming, and secondary settling in a lagoon. The cold mill wastewaters are treated in conjunction with wastewaters from other operations.

Plant 101 - and 301 (0020B & C) - Figure VII-8

Plant 301 is a revisit of 101. Wastewaters at this plant originate at twelve different cold rolling operations. All wastewaters are collected in a holding tank and are treated by ultrafiltration on a batch basis. The effluent from this system is discharged to a POTW.

Plant 102 and FF-2 (0384A-02, 03) - Figure VII-9

Plant 102 is a revisit of FF-2. Treatment consists of primary sedimentation, mixing, and clarification. The cold rolling wastewaters are combined with wastewaters from a hot strip mill prior to mixing and clarification. Flow and production data shown on Figure VII-9 are from the second visit (102).

Plant 105 (0584F-02, 03, 05) - Figure VII-10

This plant has a treatment/oil reclamation system that treats cold mill wastewaters from three recirculated and one direct application mill. Treatment at this mill consists of oil holding tanks, oil skimming and discharge to large lagoons, where additional oil and solids removal is provided. The effluent sample at this mill was taken prior to the lagoons.

Plant 302 (0060E) - Figure VII-11

The dirty rolling oils and tramp oils from the No. 1 Sendzimir mill pass through a heat exchanger and collect in a settling tank equipped with oil skimmers. The collected tramp oils are hauled to disposal, while the rolling oils are reclaimed. The effluent from the settling tank flows to a magnetic separator and then recycles to the mill.

Plant 304A and B and 305 A and B (0176-08) - Figure VII-12

Plant 305 is a revisit of Plant 304. The 12" direct application mill is represented by Plant 304B and 305A. This mill is a once through operation discharging to a central treatment plant. The W-F reversing recirculation mill was sampled as Plant 304A and 305B. Wastewater from the mill is discharged to a dirty water sump and then pumped through a filter. The filter effluent is collected in a clean water tank and recycled to the mill. A small blowdown is taken from the dirty water tank every four to six weeks and conveyed to central treatment.

Plant 306 and 307 (0248B-03) - Figure VII-13

Plant 307 is a revisit of Plant 306. Waste oil solutions collect in a dirty water sump and pass through hydromation filters. The filter effluent returns to the mill. Once a week the contents of the dirty water sump discharge to a central treatment plant in a batch dump. Central treatment consists of a surge tank, emulsion breaking, oil removal, and settling.

Plant 308 (0320) - Figure VII-14

The wastes from the No. 2 tandem mill discharge to a holding tank where oils are skimmed and removed. From the holding tank, the wastewater flows to an indexing paper filter and then recirculates to the mill.

Plant 310 (0432C) - Figure VII-15

Waste oil solutions from the 77" tandem cold mill are discharged to a steam heated oil holding tank, where the emulsion is broken and oils are removed. The tank's contents are then pumped through a double basket strainer and a filter before being recycled to the mill. About once every 100 turns, the tank is dumped to oil storage and contract removal.

Plant 315A and B (0684F) - Figure VII-16

Wastewaters from the 72" tandem mill (315A), the 84" tandem mill (315B) and other cold mill and coating line wastes discharge to primary oil separators where oils are removed. Neutralized acid pickling wastewaters and the effluent from the separators are combined in a rapid mix tank prior to introduction to flocculation and flotation units. A portion of the effluent from these units discharges to the river, and the remainder passes through a deaeration tank on its way to further treatment.

Plant 316 (0684B) - Figure VII-17

Treatment at this plant consists of a lagoon which receives wastewaters from pickling, annealing, galvanizing and terne lines as well as the 54" tandem mill. Collected oils are burned in the blast furnace and treated effluent is discharged to the river.

Plant 318 (0856P) - Figure VII-18

Reversing mill wastewaters are pumped to two 10,000 gallon holding tanks for oil removal. Collected oils are hauled off-site along with an occasional blowdown of rolling oil solution. Wastewater from the holding tanks is pumped through a filter and a magnetic separator and then recycled to the mill.

Plant 321 A, B, and C (0684D) - Figure VII-19

Wastewaters from the 28" 4 high reversing mill (321A), the 34" 4 high reversing mill (321B) and the 27" sendzimir mill (321C) each pass through a recirculation tank - filter combination. Most of these wastewaters are recycled to the respective mills. A small blowdown and leakage collects in an oil house sump, where the skimmed oils are removed for refining and the soluble oils are disposed of through contract hauling.

Combination Mills

Seven combination operations were sampled during this study. The raw and effluent data for the original guidelines survey are summarized in Table VII-4. Data from the toxic pollutant surveys are shown in Table VII-5.

Plant DD-2 (0584E-01) Figure VII-20

Oil skimming, chemical treatment, and final settling in a lagoon, are provided prior to discharge.

Plant 311 and YY-2 (0432D) - Figure VII-21

Plant 311 is a revisit of YY-2. Primary settling, oil skimming, chemical treatment, and final settling in a flocculating clarifier are provided. Other wastewaters are combined with the cold mill wastewaters at this central treatment system.

Plant 312A and B (0948C -04, 02) - Figure VII-22

The No. 2 tin mill (312A) discharges its wastewaters to an oil separator and then to a central treatment facility. This facility consists of primary mixers, scalping tanks, secondary mixers and clarifiers. Sludge from the scalping tanks and clarifiers is concentrated in a thickener and dewatered by a centrifuge.

Wastes from the No. 3 sheet mill (312B) are treated in an oil skimmer tank and discharged to the hot strip mill wastewater treatment plant.

Plant 313A (0584A-02) - Figure VII-23

Roll solutions from the #4 tandem mill discharge to a skim tank and combine with other wastewaters in a concentrate tank. The concentrate tank discharges to central treatment for further processing.

Plant 319 (0856F-01) - Figure VII-24

The wastewater from this mill is treated in a central wastewater treatment system which consists of neutralization, flocculation and clarification.

Plant 320A (0860B-03) - Figure VII-25

Wastewaters from the combination mill are treated in a central wastewater treatment plant which consists of emulsion breaking, surface skimming, flocculation with lime and polymer, neutralization and clarification.

Direct Application Mills

Five direct application operations were visited. Two operations were sampled twice, once during the original guidelines study and once during the toxic pollutant study. Only the data from the second visits are used to characterize these mills. The raw and treated effluent data for these operations are presented in Table VII-6.

Plant 105 and VV-2 (0584F-04) - Figure VII-10

Refer to the discussion presented for recirculation mills

Plant 106(0112B-01, 03-06) - Figure VII-26

At this plant, wastewaters from six direct application mills are collected in a sump where floating oils are collected; filtered with twelve upflow sand filters; combined with neutralized pickling and galvanizing wastes; and settled in a thickener. The overflow from the thickener is then discharged.

Plant 304B and 305A (0176-02) - Figure VII-12

Refer to the discussion presented for recirculation mills.

Plant 313B (0584A-02) - Figure VII-27

The two single stand skin pass mills discharge to a mill sump which receives wastewaters from the rewinder, slitter and shear shops as well. The combined wastewater is then pumped to the cold mill wastewater treatment plant which consists of emulsion breaking, flocculation with lime and polymer, neutralization with lime, and surface skimming.

Summary of Long-Term Monitoring Data

Long-term effluent data were obtained for two cold rolling operations. These data are summarized in Table VII-7. Data for the wastewater at Plant 0684F were obtained before it entered final clarification and neutralization. Data for Plant 0920G were provided for the wastewater after chemical treatment and sedimentation. These treatment systems and sampling locations are illustrated in Figures VII-16 and VII-28 for Plant 0684F and 0920G, respectively.

In addition to the long term data, Plant 0684F was intensively monitored for 20 days. The sampling program was designed to characterize the wastewater treatment system with respect to toxic pollutant removals. The wastewater treatment system consists of emulsion breaking with pickling rinse waters followed by dissolved air flotation. The raw data and summary from this sampling survey is presented in Table VII-8 along with a summary of long term data for total suspended solids, and oil and grease. The data shows that dissolved air flotation is capable of removing toxic organic pollutants to low levels and over the long term performs consistently well with respect to total suspended solids and oil and grease removal. During the sampling period, the rolling solutions were changed and the oil application system was cleaned. Although the waste oil was discharged to a holding tank and bled into the wastewater treatment system, a noticeable degradation in wastewater quality was observed during this period. The discharge of oil and grease, and toxic organic pollutants increased. Tetrachloroethylene was also detected during this period. The data indicate that indiscriminate dumping of waste oil and cleaning solutions could result in the discharge of high levels of toxic organic pollutants. It should be noted that the long term data for total suspended solids show that the observed maximum concentration (66 mg/l) exceeded the concentration basis (60 mg/l) for the daily maximum effluent limitation. This, however, is a single exceedence out of 104 observations. Exceedence at this frequency (1 out of 100) is not unexpected.

Effect of Makeup Water Quality

Where the mass loading of a limited pollutant in the makeup water to a process is small in relation to the raw waste loading of that pollutant, the impact of makeup water quality on wastewater treatment system performance is not significant, and, in many cases, not measureable. In these instances, the Agency has determined that the respective effluent limitations and standards should be developed and applied on a gross basis.

The data presented in Tables VII-9 through VII-11 for recirculation, combination and direct application mills, respectively, indicate that the conventional and toxic organic pollutants in the intake water supply are insignificant when compared with the concentrations of the same pollutants in the raw wastewaters. For certain toxic metals (chromium, lead and nickel for combination mills, and chromium and zinc for direct application mills), the levels in the make-up water appear to be significant when compared to raw waste levels. However, the raw waste levels of the above mentioned raw metals at the sampled plants are near both background and treatability levels. In the case of nickel for the combination mills, an abnormally high intake value tends to skew the results. The toxic metals limitations for cold rolling operations are based upon the same effluent concentrations used to develop the acid pickling limitations, so that these wastewaters may be co-treated. Therefore, the Agency believes that the effect of make-up water quality for the combined wastewater streams is not significant. In the rare case of treatment for stand alone cold rolling operations (the Agency is not aware of any such plants), treatment for toxic metals would not be necessary, if the raw waste levels were below the BPT or BAT limitations, as is the case at some mills. Thus, the Agency has determined that the effluent limitations and standards should be applied on a gross basis, except to the extent provided by 40 CFR 122.63(h).

TABLE VII-1

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. Operating Modes

1. OT Once-Through

2. Rt,s,n Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn Blowdown, where n = discharge as % of raw waste flow

B. Control Technology

10. DI Deionization

11. SR Spray/Fog Rinse

12. CC Countercurrent Rinse

13. DR Drag-out Recovery

C. Disposal Methods

20. H Haul Off-Site

21. DW Deep Well Injection

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 2

C. Disposal Methods (cont.)

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. Treatment Technology

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

D. Treatment Technology (cont.)

43. FLt Flocculation, where t = type

t: L = Lime
A = Alum
P = Polymer
M = Magnetic
O = Other, footnote

44. CY Cyclone/Centrifuge/Classifier

44a. DT Drag Tank

45. CL Clarifier

46. T Thickener

47. TP Tube/Plate Settler

48. SLn Settling Lagoon, where n = days of retention time

49. BL Bottom Liner

50. VF Vacuum Filtration (of e.g., CL, T, or TP underflows)

51. Ft,m,h Filtration, where t = type
m = media
h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52. CLt Chlorination, where t = type

t: A = Alkaline
B = Breakpoint

53. CO Chemical Oxidation (other than CLA or CLB)

D. Treatment Technology (cont.)

54.	BOt	Biological Oxidation, where t = type t: An = Activated Sludge n = No. of Stages T = Trickling Filter B = Biodisc O = Other, footnote
55.	CR	Chemical Reduction (e.g., chromium)
56.	DP	Dephenolizer
57.	ASt	Ammonia Stripping, where t = type t: F = Free L = Lime C = Caustic
58.	APt	Ammonia Product, where t = type t: S = Sulfate N = Nitric Acid A = Anhydrous P = Phosphate H = Hydroxide O = Other, footnote
59.	DSt	Desulfurization, where t = type t: Q = Qualifying N = Nonqualifying
60.	CT	Cooling Tower
61.	AR	Acid Regeneration
62.	AU	Acid Recovery and Reuse
63.	ACt	Activated Carbon, where t = type t: P = Powdered G = Granular
64.	IX	Ion Exchange
65.	RO	Reverse Osmosis
66.	D	Distillation

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. Treatment Technology (cont.)

67.	AAl	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide

TABLE VII-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
COLD ROLLING - RECIRCULATION

Raw Wastewaters

Plant Code	D		I		P		X-2		BB-2	
Reference Code	248B		432K		0156B		060B-03		060-03	
Sample Point	11		2		26		4		5	
Flow, GPT	57		0.8		58,280		17.7		16.0	
	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs
TSS	1,740	0.41	NA	NA	NA	NA	90	0.0066	55	0.0037
Oil & Grease	3,700	0.88	36,000	0.12	1165	283	41,100	3.03	664	0.044
Dissolved Iron	NA	NA	NA	NA	NA	NA	1.2	0.000089	0.05	0.0000033
pH (Units)	6.8		NA		NA		7.0		8.0	
119 Chromium	0.10	0.000024	NA	NA	NA	NA	NA	NA	NA	NA
120 Copper	0.010	0.0000024	NA	NA	NA	NA	NA	NA	NA	NA
124 Nickel	0.62	0.00015	NA	NA	NA	NA	NA	NA	NA	NA
128 Zinc	0.030	0.0000071	NA	NA	NA	NA	NA	NA	NA	NA

Treated Effluents

Plant Code	D		I		P		X-2		BB-2	
Reference Code	248B		432K		0156B		060B-03		060-03	
Sample Point	5		3		27		5		7	
Flow, GPT	57		0		0		17.7		16.0	
C&TT(1)	Scr, EB, SS, CY		(2)		PSP, RTP		EB, GF, CL, SS		DW, EB, T, FLP, FP, ML, CL, SL, SS, VF	
	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs
TSS	961	0.23	NA (3)		NA	0.0	20	0.0015	2.0	0.00013
Oil & Grease	1,049	0.25			1450	0.0	4	0.00030	6.0	0.00040
Dissolved Iron	NA	NA			NA	0.0	0.10	0.0000073	0.04	0.0000026
pH (Units)	12.0				NA		7.8		7.7	
119 Chromium	<0.03	0.0			NA	0.0	NA	NA	NA	NA
120 Copper	0.33	0.000078			NA	0.0	NA	NA	NA	NA
124 Nickel	0.050	0.000012			NA	0.0	NA	NA	NA	NA
128 Zinc	0.33	0.000078			NA	0.0	NA	NA	NA	NA

TABLE VII-2
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
COLD ROLLING - RECIRCULATION
PAGE 2

Raw Wastewaters

	Plant Code	EE-2		XX-2			
	Reference Code	112D-01		684I-01			
	Sample Point	1		2		Average	
	Flow, GPT	17.4		138		41	
		mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs
	TSS	637	0.046	260	0.15	556	0.12
	Oil & Grease	1,180	0.086	619	0.36	12,060	41.1
	Dissolved Iron	1.00	0.000073	NA	NA	1.1	0.000081
	pH (Units)	6.8		7.1		6.8-8.0	
119	Chromium	NA	NA	NA	NA	0.10	0.000024
120	Copper	NA	NA	NA	NA	0.010	0.0000024
124	Nickel	NA	NA	NA	NA	0.62	0.00015
128	Zinc	NA	NA	NA	NA	0.030	0.000071

Treated Effluents

	Plant Code	EE-2		XX-2	
	Reference Code	112D-01		684I-01	
	Sample Point	2		5	
	Flow, GPT	17.4		138	
	C&TT(1)	CR,FLP,ML,MW,CL,SL,SS		MW,PSP,SSP,SS,CNT,BD,SL	
		mg/l	lbs/1000 lbs	mg/l	lb/1000 lbs
	TSS	2.0	0.00015	30	0.017
	Oil & Grease	4.0	0.00029	7	0.0040
	Dissolved Iron	0.020	0.0000014	NA	NA
	pH (Units)	7.8		7.3	
119	Chromium	NA	NA	NA	NA
120	Copper	NA	NA	NA	NA
124	Nickel	NA	NA	NA	NA
128	Zinc	NA	NA	NA	NA

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(1) For C&TT abbreviations, see Table VII-1.
(2) Recirculated oil emulsions treated in a filter. The only discharge from this system is waste oil solutions.
(3) Discharge consists of waste oil solutions.

NA: Not analyzed

TABLE VII-3

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS

Raw Wastewaters

Plant Code	101(1)		102		105		301		302		304A	
Reference No.	020B&C		384A(02,03)		584F(02,03,05)		020B&C		060E		176(08)	
Sample Points	B		E		E		B		A		B	
Flow (gal/ton)	4.5		49		1.1		8.8		0.054		0.23	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
TSS	2220	0.042	556	0.11	5040	0.023	170	0.0062	NA	-	529	0.0020
Oil & Grease	82,210	1.54	1076	0.22	37,200	0.17	2506	0.091	NA	-	36,000	0.14
Dissolved Iron	6.5	0.00012	4.8	0.00098	517	0.0023	NA	NA	NA	-	NA	-
pH (units)	6.5		6.7		5.8		2.3-4.5		NA		7.5	
001 Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
011 1,1,1-Trichloroethane	0.42	0.000008	0.019	0.000004	ND	ND	0.10	0.0000036	ND	ND	0.01	0.0
013 1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	0.16	0.0000056	ND	ND	0.0	0.0
023 Chloroform	0.08	0.000001	0.011	0.000002	0.54	0.000002	<0.01	<0.000005	ND	ND	ND	ND
039 Fluoranthene	0.0	0.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
055 Naphthalene	ND	ND	ND	ND	ND	ND	0.54	0.000020	ND	ND	ND	ND
060 4,6-Dinitro-o-cresol	ND	ND	0.94	0.00019	ND	ND	ND	ND	ND	ND	ND	ND
065 Phenol	ND	ND	0.068	0.000014	0.0	0.0	0.090	0.000032	ND	ND	ND	ND
072 Benzo-a-anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
076 Chrysene	0.0	0.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
077 Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
078 Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0	0.000014
080 Fluorene	0.0	0.0	0.015	0.000003	ND	ND	0.16	0.0000060	ND	ND	ND	ND
081 Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0	0.000014
084 Pyrene	0.0	0.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
085 Tetrachloroethylene	1.15	0.000022	0.0	0.0	0.48	0.00002	0.062	0.0000025	ND	ND	ND	ND
086 Toluene	0.11	0.000002	ND	ND	0.064	**	0.019	**	ND	ND	0.0	0.0
087 Trichloroethylene	0.018	**	ND	ND	ND	ND	0.14	0.0000049	ND	ND	ND	ND
114 Antimony	0.1	0.000002	<0.10	<0.000020	0.13	**	0.0	0.0	NA	-	0.012	**
115 Arsenic	NA	NA	NA	NA	0.58	0.000003	0.41	0.000015	NA	-	0.060	**
118 Cadmium	0.045	**	<0.01	<0.000002	0.45	0.000002	0.031	0.0000014	NA	-	0.022	**
119 Chromium	6.5	0.00012	0.06	0.000012	0.38	0.000017	1.08	0.000039	NA	-	10.4	0.000010
120 Copper	7.5	0.00014	0.70	0.00014	2.26	0.000010	3.65	0.00013	NA	-	28.4	0.000029
122 Lead	1.55	0.000029	0.21	0.000043	2.5	0.000011	0.53	0.000019	NA	-	0.57	0.0000012
124 Nickel	NA	NA	0.23	0.000047	1.0	0.000005	1.58	0.000056	NA	-	11.5	0.000011
128 Zinc	1.75	0.000033	0.18	0.000037	0.68	0.000003	7.95	0.00029	NA	-	9.5	0.000010

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
PAGE 2

Raw Wastewaters

Plant Code	305B		306		307		308	
Reference No.	176(08)		248B(03)		248B(03)		320	
Sample Points	B		B		B		B	
Flow (gal/ton)	0.27		3.5		4.2		2.5	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
TSS	NA	-	1051	0.015	NA	-	NA	-
Oil & Grease	NA	-	NA$^{(2)}$	-	NA	-	NA	-
Dissolved Iron	NA	-	NA	-	NA	-	NA	-
pH (units)	NA		6.8-7.9		NA		NA	
001 Acenaphthene	ND	ND	ND	ND	ND	ND	0.825	0.000008
011 1,1,1-Trichloroethane	0.80	**	0.038	**	ND	ND	ND	ND
013 1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
023 Chloroform	ND	ND	ND	ND	ND	ND	ND	ND
039 Fluoranthene	ND	ND	ND	ND	0.10	0.000002	1.9	0.000018
055 Naphthalene	ND	ND	ND	ND	0.18	0.000003	1.45	0.000014
060 4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND	ND	ND
065 Phenol	ND	ND	ND	ND	ND	ND	ND	ND
072 Benzo-a-anthracene	ND	ND	ND	ND	ND	ND	2.4	0.000023
076 Chrysene	ND	ND	ND	ND	0.10	0.000002	1.5	0.000015
077 Acenaphthylene	ND	ND	ND	ND	ND	ND	2.05	0.000020
078 Anthracene	0.22	**	ND	ND	0.06	0.000001	ND	ND
080 Fluorene	ND	ND	ND	ND	ND	ND	5.6	0.000054
081 Phenanthrene	1.24	0.000002	ND	ND	0.87	0.000015	5.4	0.000053
084 Pyrene	ND	ND	ND	ND	0.36	0.000006	2.2	0.000021
085 Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	ND
086 Toluene	ND	ND	0.035	**	ND	ND	ND	ND
087 Trichloroethylene	ND	ND	0.025	**	ND	ND	ND	ND
114 Antimony	NA	-	0.014	**	NA	-	NA	-
115 Arsenic	NA	-	<0.005	**	NA	-	NA	-
118 Cadmium	NA	-	0.040	**	NA	-	NA	-
119 Chromium	NA	-	3.13	0.000046	NA	-	NA	-
120 Copper	NA	-	7.44	0.00020	NA	-	NA	-
122 Lead	NA	-	10.5	0.00015	NA	-	NA	-
124 Nickel	NA	-	4.7	0.000069	NA	-	NA	-
128 Zinc	NA	-	3.7	0.000055	NA	-	NA	-

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
PAGE 3

Treated Effluent

Plant Code	101		102		105		301		302		304A	
Reference No.	020B&C(1)		384A(02,03)		584F(02,03,05)		020B&C		060E		176(08)	
Sample Points	B		E		E		B		(5)		NA	
Flow (gal/ton)	4.5		49		1.1		8.8		0.0(4)		0.9	
C&TT	ULTRAFILTRATION		PSP,EB,CL(3)		EB,SS		ULTRAFILTRATION		SB,RUP100		NOT APPLICABLE	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
TSS	198.5	0.0037	20	0.027			76.5	0.0028	-	0.0	-	-
Oil & Grease	140	0.0026	3.0	0.0075	Samples of the effluent at the plant were not available. Effluent data therefore will not be presented.		13.1	0.00047	-	0.0	The cold mill at this plant discharges into a large central treatment system. No effluent samples were taken of this treatment system.	
Dissolved Iron	805	0.015	15.7	0.027			NA	NA	-	0.0		
pH (units)	4.1		8.2				2.4-4.9		-			
001 Acenaphthene	ND	ND	ND	ND			0.0	0.0	-	0.0		
011 1,1,1-Trichlorethane	*	**	ND	ND			0.056	0.0000021	-	0.0		
013 1,1-Dichloroethane	ND	ND	ND	ND			0.014	**	-	0.0		
023 Chloroform	0.038	**	0.019	0.000004			<0.01	**	-	0.0		
039 Fluoranthene	ND	ND	0.0	0.0			ND	ND	-	0.0		
055 Napthalene	0.034	**	ND	ND			0.10	0.0000036	-	0.0		
060 4,6-Dinitro-o-cresol	ND	ND	0.0	0.0			ND	ND	-	0.0		
065 Phenol	0.055	0.000001	0.0	0.0			0.50	0.000018	-	0.0		
072 Benzo-a-anthracene	ND	ND	ND	ND			ND	ND	-	0.0		
076 Chrysene	ND	ND	ND	ND			ND	ND	-	0.0		
077 Acenaphthylene	ND	ND	0.0	0.0			ND	ND	-	0.0		
078 Anthracene	ND	ND	0.0	0.0			0.0	0.0	-	0.0		
080 Fluorene	0.0	0.0	0.0	0.0			0.033	0.000002	-	0.0		
081 Phenanthrene	ND	ND	0.0	0.0			ND	ND	-	0.0		
084 Pyrene	ND	ND	0.0	0.0			ND	ND	-	0.0		
085 Tetrachloroethylene	0.016	**	ND	ND			0.033	0.0000014	-	0.0		
086 Toluene	0.060	0.000001	ND	ND			0.10	0.0000039	-	0.0		
087 Trichloroethylene	ND	ND	0.0	0.0			0.064	0.0000021	-	0.0		
114 Antimony	0.30	0.000006	<0.10	<0.000020			<0.002	**	-	0.0		
115 Arsenic	NA	NA	NA	NA			0.30	0.000011	-	0.0		
118 Cadmium	0.020	**	<0.010	<0.000002			0.026	0.0000011	-	0.0		
119 Chromium	1.17	0.000022	<0.030	<0.000006			0.41	0.000015	-	0.0		
120 Copper	0.065	0.000001	<0.020	<0.000004			0.025	0.0000011	-	0.0		
122 Lead	0.09	0.000002	<0.050	<0.000010			0.34	0.000013	-	0.0		
124 Nickel	NA	NA	<0.025	<0.000005			1.23	0.000045	-	0.0		
128 Zinc	5.25	0.000099	0.015	0.00003			7.1	0.00026	-	0.0		

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
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Treated Effluent

Plant Code	305B		306		307		30C	
Reference No.	176(08)		248B(03)		248B(03)		320	
Sample Points	D		D		$(\frac{B}{C})$D		A	
Flow (gal/ton)	0.27		3.5		4.1		0.0(4)	
C&TT	CNT:EB,N,FL,CL,CY,T		SURGE TANK,EB,OB,SB		SURGE TANK,SB,SS		SB,SS, FILTER	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
TSS	NA	-	52	0.00076	NA	-	NA	0.0
Oil & Grease	NA	-	133	0.0019	NA	-	NA	0.0
Dissolved Iron	NA	-	NA	NA	NA	-	NA	0.0
pH (units)	NA		5.8-6.8		NA		NA	
001 Acenaphthene	ND	ND	ND	ND	ND	ND	ND	0.0
011 1,1,1-Trichloroethane	0.003	**	<0.01	**	ND	ND	ND	0.0
013 1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	0.0
023 Chloroform	ND	ND	<0.01	**	ND	ND	ND	0.0
039 Fluoranthene	ND	ND	ND	ND	0.002	**	ND	0.0
055 Naphthalene	ND	ND	0.010	**	0.133	**	ND	0.0
060 4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND	ND	0.0
065 Phenol	0.018	**	0.14	0.000002	0.099	**	0.25	0.0
072 Benzo-a-anthracene	ND	ND	ND	ND	ND	ND	ND	0.0
076 Chrysene	ND	ND	ND	ND	ND	ND	ND	0.0
077 Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	0.0
078 Anthracene	ND	ND	ND	ND	0.008	-	ND	0.0
080 Fluorene	ND	ND	ND	ND	ND	ND	2.05	0.0
081 Phenanthrene	ND	ND	ND	ND	0.02	**	1.5	0.0
084 Pyrene	ND	ND	ND	ND	ND	ND	ND	0.0
085 Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	0.0
086 Toluene	ND	ND	0.005	**	0.022	**	ND	0.0
087 Trichloroethylene	ND	ND	<0.01	**	ND	ND	ND	0.0
114 Antimony	NA	NA	0.002	**	NA	-	NA	0.0
115 Arsenic	NA	NA	<0.005	**	NA	-	NA	0.0
118 Cadmium	NA	NA	0.004	**	NA	-	NA	0.0
119 Chromium	NA	NA	0.19	0.000003	NA	-	NA	0.0
120 Copper	NA	NA	0.41	0.000006	NA	-	NA	0.0
122 Lead	NA	NA	0.11	0.000002	NA	-	NA	0.0
124 Nickel	NA	NA	0.31	0.000005	NA	-	NA	0.0
128 Zinc	NA	NA	0.32	0.000005	NA	-	NA	0.0

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
PAGE 5

Raw Wastewaters

Plant Code	310		315A		315B		316		318		321A	
Reference No.	432C		684F		684F		684B		856P		684D	
Sample Points	A		A(6)		B(6)		A		A(6)		A(7)	
Flow (gal/ton)	0.18		8.7		4.3		144		0.8		10	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
TSS	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
Oil & Grease	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
Dissolved Iron	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
pH (units)	NA		NA		NA		NA		NA		NA	
001 Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
011 1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
013 1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
023 Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
039 Fluoranthene	1.5	0.0000011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
055 Naphthalene	0.71	**	1.5	0.000054	0.75	0.000014	1.15	0.00069	0.14	0.0000005	8.45	-
060 4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
065 Phenol	ND	ND	ND	ND	1.0	0.000018	ND	ND	ND	ND	ND	ND
072 Benzo-a-anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
076 Chrysene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
077 Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
078 Anthracene	0.21	**	1.6	0.000056	ND	ND	ND	ND	ND	ND	ND	ND
080 Fluorene	1.85	0.0000014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
081 Phenanthrene	2.05	0.0000015	0.82	0.000030	ND	ND	ND	ND	ND	ND	ND	ND
084 Pyrene	1.55	0.0000011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
085 Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
086 Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
087 Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
114 Antimony	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
115 Arsenic	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
118 Cadmium	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
119 Chromium	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
120 Copper	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
122 Lead	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
124 Nickel	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
128 Zinc	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
PAGE 6

Raw Wastewaters

Plant Code	321B		321C					
Reference No.	684D		684D					
Sample Points	D		E		Average(8)		Overall(9) Average	
Flow (gal/ton)	10(7)		10(7)		16		23	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
TSS	NA	-	NA	-	1470	0.031	1013	0.077
Oil & Grease	NA	-	NA	-	19,200	0.16	14,700	0.51
Dissolved Iron	NA	-	NA	-	261	0.0016	105	0.00069
pH (units)	NA		NA		2.3-7.9		2.3-8.0	
001 Acenaphthene	ND	ND	ND	ND	0.055	**	0.055	**
011 1,1,1-Trichloroethane	0.025	-	ND	ND	0.063	**	0.063	**
013 1,1-Dichloroethane	ND	ND	ND	ND	0.011	**	0.011	**
023 Chloroform	ND	ND	ND	ND	0.037	**	0.037	**
039 Fluoranthene	0.60	-	ND	ND	0.27	0.0000014	0.27	0.0000014
055 Naphthalene	3.85	-	3.85	-	1.5	0.000053	1.5	0.000053
060 4,6-Dinitro-o-cresol	ND	ND	ND	ND	0.063	0.000013	0.063	0.000013
065 Phenol	1.4	-	ND	ND	0.17	0.000002	0.17	0.000002
072 Benzo-a-anthracene	ND	ND	ND	ND	0.16	0.000002	0.16	0.000002
076 Chrysene	ND	ND	ND	ND	0.11	0.000001	0.11	0.000001
077 Acenaphthylene	ND	ND	ND	ND	0.14	0.000001	0.14	0.000001
078 Anthracene	ND	ND	ND	ND	0.14	0.000004	0.14	0.000004
080 Fluorene	0.40	-	42.0	-	3.5	0.000004	3.5	0.000004
081 Phenanthrene	1.90	-	ND	ND	0.91	0.000007	0.91	0.000007
084 Pyrene	0.32	-	ND	ND	0.30	0.000002	0.30	0.000002
085 Tetrachloroethylene	ND	ND	ND	ND	0.036	**	0.036	**
086 Toluene	0.10	-	ND	ND	0.012	**	0.012	**
087 Trichloroethylene	ND	ND	ND	ND	0.009	**	0.009	**
114 Antimony	NA	-	NA	-	0.031	**	0.031	**
115 Arsenic	NA	-	NA	-	0.26	0.000005	0.26	0.000005
118 Cadmium	NA	-	NA	-	0.11	**	0.11	**
119 Chromium	NA	-	NA	-	3.0	0.000025	2.5	0.000025
120 Copper	NA	-	NA	-	8.5	0.00010	7.1	0.000084
122 Lead	NA	-	NA	-	2.9	0.000045	2.9	0.000045
124 Nickel	NA	-	NA	-	3.8	0.000038	3.3	0.000056
128 Zinc	NA	-	NA	-	4.4	0.000079	3.7	0.000067

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
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Treated Effluent

Plant Code	310		315A		315B		316		318		321A	
Reference No.	432C		684		684F(03)		684B		856P		684D	
Sample Points	(5)		$(\frac{B}{C})$D		$(\frac{A}{C})$D		(5)		(4)(5)		(5)	
Flow (gal/ton)	0.0$^{(4)}$		8.7		4.3		144		0.0		0.0	
C&TT	-		SS, FL, FLOTATION		SS, FL, FLOTATION		CNT		SS, HYDROMATION FILTER		SS, HOFFMANN FILTER	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
TSS	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
Oil & Grease	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
Dissolved Iron	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
pH (units)	-	-	NA				-		-		-	
001 Acenaphthene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
011 1,1,1-Trichloroethane	-	-	0.001	-	0.001	-	-	-	-	0.0	-	0.0
013 1,1-Dichloroethane	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
023 Chloroform	-	-	0.006	-	0.006	-	-	-	-	0.0	-	0.0
039 Fluoranthene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
055 Naphthalene	-	-	0.034	-	0.034	-	-	-	-	0.0	-	0.0
060 4,6-Dinitro-o-cresol	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
065 Phenol	-	-	0.074	-	0.074	-	-	-	-	0.0	-	0.0
072 Benzo-a-anthracene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
076 Chrysene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
077 Acenaphthylene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
078 Anthracene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
080 Fluorene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
081 Phenanthrene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
084 Pyrene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
085 Tetrachloroethylene	-	-	0.020	-	0.020	-	-	-	-	0.0	-	0.0
086 Toluene	-	-	0.004	-	0.004	-	-	-	-	0.0	-	0.0
087 Trichloroethylene	-	-	ND	ND	ND	ND	-	-	-	0.0	-	0.0
114 Antimony	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
115 Arsenic	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
118 Cadmium	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
119 Chromium	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
120 Copper	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
122 Lead	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
124 Nickel	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0
128 Zinc	-	-	NA	-	NA	-	-	-	-	0.0	-	0.0

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
PAGE 8

Treated Effluent

Plant Code	321B		321C	
Reference No.	684D		684D	
Sample Points	(5)		(5)	
Flow (gal/ton)	0.0		0.0	
C&TT	SS,HOFFMAN FILTER		SS,HOFFMAN FILTER	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
TSS	-	0.0	-	0.0
Oil & Grease	-	0.0	-	0.0
Dissolved Iron	-	0.0	-	0.0
pH (units)	-	0.0	-	0.0
001 Acenaphthene	-	0.0	-	0.0
011 1,1,1-Trichloroethane	-	0.0	-	0.0
013 1,1-Dichloroethane	-	0.0	-	0.0
023 Chloroform	-	0.0	-	0.0
039 Fluoranthene	-	0.0	-	0.0
055 Naphthalene	-	0.0	-	0.0
060 4,6-Dinitro-o-cresol	-	0.0	-	0.0
065 Phenol	-	0.0	-	0.0
072 Benzo-a-anthracene	-	0.0	-	0.0
076 Chrysene	-	0.0	-	0.0
077 Acenaphthylene	-	0.0	-	0.0
078 Anthracene	-	0.0	-	0.0
080 Fluorene	-	0.0	-	0.0
081 Phenanthrene	-	0.0	-	0.0
084 Pyrene	-	0.0	-	0.0
085 Tetrachloroethylene	-	0.0	-	0.0
086 Toluene	-	0.0	-	0.0
087 Trichloroethylene	-	0.0	-	0.0
114 Antimony	-	0.0	-	0.0
115 Arsenic	-	0.0	-	0.0
118 Cadmium	-	0.0	-	0.0
119 Chromium	-	0.0	-	0.0
120 Copper	-	0.0	-	0.0
122 Lead	-	0.0	-	0.0
124 Nickel	-	0.0	-	0.0
128 Zinc	-	0.0	-	0.0

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
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(1) Twelve cold rolling mills discharge to a joint treatment system. The designation of these mills is as follows: 020B (01,02,04,05) and 020C (01-08).
(2) Sample could not be analyzed due to formation of heavy oil emulsion.
(3) For C&TT abbreviations, see Table VII-1.
(4) No discharge. Waste oils and solutions are contract hauled off-site.
(5) No sample of the treated effluent was obtained during the visit.
(6) The flow data is derived from the basic questionnaire since flow information is not available in the sampling visit report.
(7) Total flow for all three mills (321A,B and C).
(8) The averages do not include any data from Plant 101 since it was later revisited as Plant 301 whose data is considered more representative of current plant operations. The toxic metals data for Plant 306 is not included in the averages since it was also later resampled as Plant 307.
(9) Overall average includes values from Table VII-2.

NA: Not analyzed
ND: Not detected
- : Data is not available or is insufficient for calculation purposes
**: Value is less than 0.000001 lbs/10000 lbs

TABLE VII-4

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES SURVEY
COLD ROLLING - COMBINATION

Raw Wastewater

Plant Code	DD-2	
Reference Code	584E-01	
Sample Point	1	
Flow, gal/ton	512	
	mg/l	lbs/1000 lbs
Total Suspended Solids	987	2.11
Oil & Grease	1,399	2.99
Dissolved Iron	7.8	0.017
pH	5.7	

Treated Effluents

Plant Code	DD-2	
Reference Code	584E-01	
Sample Points	2	
Flow, gal/ton	512	
C&TT	Chem. Treat. & Lagoons	
	mg/l	lbs/1000 lbs
Total Suspended Solids	6	0.013
Oil & Grease	4	0.085
Dissolved Iron	0.04	0.000085
pH	7.7	

NA: Not analyzed

TABLE VII-5

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - COMBINATION

Raw Wastewaters

	Plant Code	311		312A		312B		313A		319		320A		Average(2)	
	Reference No.	432D		948C(04)		948C(02)		584A(02)		856F(01)		860B(03)			
	Sample Points	B		A		C		A		D		B			
	Flow (gal/ton)	156		1500		207		55		112		1.02		363	
		mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs
	TSS	NA	-	NA	-	NA	-	NA	-	699	0.33	NA	-	843	1.22
	Oil & Grease	NA	-	NA	-	NA	-	NA	-	1563	0.74	NA	-	1481	1.86
	pH (Units)	NA		NA		NA		NA		6.6		NA		5.7-6.6	
039	Fluoranthene	ND	0.0	ND	0.0	0.50	0.00043	ND	0.0	ND	0.0	ND	0.0	0.071	0.000061
055	Napthalene	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	0.0	24	0.00010	4.0	0.000017
078	Anthracene	ND	0.0	ND	0.0	1.05	0.00091	ND	0.0	ND	0.0	ND	0.0	0.18	0.00015
080	Fluorene	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	0.0	5.9	0.000025	0.98	0.0000042
081	Phenanthrene	ND	0.0	2.2	0.014	2.40	0.0021	ND	0.0	ND	0.0	26.2	0.00011	5.1	0.0027
084	Pyrene	ND	0.0	ND	0.0	0.30	0.00026	ND	0.0	ND	0.0	ND	0.0	0.05	0.000043
115	Arsenic	NA	-	NA	-	NA	-	NA	-	0.16	0.000075	NA	-	0.16	0.000075
119	Chromium	NA	-	NA	-	NA	-	NA	-	0.03	0.000013	NA	-	0.03	0.000013
120	Copper	NA	-	NA	-	NA	-	NA	-	0.89	0.00042	NA	-	0.89	0.00042
124	Nickel	NA	-	NA	-	NA	-	NA	-	0.21	0.000099	NA	-	0.21	0.000099
128	Zinc	NA	-	NA	-	NA	-	NA	-	0.15	0.000070	NA	-	0.15	0.000070

TABLE VII-5
SUMMARY OF ANALYTICAL DATA
TOXIC POLLUTANT STUDY
COLD ROLLING - COMBINATION
PAGE 2

Effluents

Plant Code	311		312A		312B		313A		319		320A	
Reference No.	432D		948C(04)		948C(02)		584A(02)		856F(01)		860B(03)	
Sample Points	B,C (1) A		B		D		A		D,F (2) E		E	
Flow (gal/ton)	156		1500		207		55		112		1.02	
C&TT	SS,CL,T,OT		SS,CL,T,OT		SS,CL,T,OT		Skim tank, CNT,OT		CR,NW,NL,FLL, SS,CL,OT		CNT	
	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs
TSS	NA	-	NA	-	NA	-	NA	-	215	0.29	NA	-
Oil & Grease	NA	-	NA	-	NA	-	NA	-	835	1.26	NA	-
pH (Units)	7.5		NA		NA		NA		6.7		NA	
039 Fluoranthene	ND	-	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	-
055 Napthalene	0.003	-	ND	0.0	ND	0.0	ND	0.0	ND	0.0	0.024	-
078 Anthracene	ND	-	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	-
080 Fluorene	ND	-	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	-
081 Phenanthrene	ND	-	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	-
084 Pyrene	ND	-	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	-
115 Arsenic	NA	-	NA	-	NA	-	NA	-	0.035	0.000068	NA	-
119 Chromium	NA	-	NA	-	NA	-	NA	-	0.017	0.000030	NA	-
120 Copper	NA	-	NA	-	NA	-	NA	-	0.18	0.00032	NA	-
124 Nickel	NA	-	NA	-	NA	-	NA	-	0.055	-	NA	-
128 Zinc	NA	-	NA	-	NA	-	NA	-	0.054	0.000079	NA	-

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(1) Flow includes wastes from other sources and is not included in the average.
(2) Includes values from Table VII-4.
(3) Sample E is a sample of the central wastewater treatment plant. There were insufficient samples collected to enable calculation of lbs/1000 lbs attributable to this mill.
ND: Not Detected
NA: Not Analyzed
- Data is not available or is insufficient for calculation purposes.

TABLE VII-6

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - DIRECT APPLICATION

Raw Wastewaters

	Plant Code	105		106		304B(1)		305		313B			
	Reference No.	584F(04)		112b(01603-06)		176(02)		176(02)		584B			
	Sample Points	D		B		C		C		C(4)		Average	
	Flow (gal/ton)	424		670		233		130		73		442	
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Total Suspended Solids	290	0.51	99	0.28	14.3	0.013	NA	NA	NA	-	135	0.27
	Oil & Grease	1.861	3.29	1605	4.48	178	0.16	NA	NA	NA	-	1215	2.65
	Dissolved Iron	23.3	0.041	NA	NA	NA	NA	NA	NA	NA	-	23.3	0.041
	pH	7.2		6.5-9.0		6.7-7.7		NA		NA		6.5-9.0	
6	Carbon Tetrachloride	0.03	0.000058	ND	ND	ND	ND	NA	NA	ND	ND	0.007	0.000015
11	1,1,1-Trichloroethane	0.14	0.00025	0.0	0.0	ND	ND	0.032	0.000017	ND	ND	0.043	0.000067
55	Naphthalene	ND	ND	0.0	0.0	ND	ND	ND	ND	17.5	0.0053	4.4	0.0013
78	Anthracene	ND	ND	0.0	0.0	0.055	0.000058	NA	NA	ND	ND	0.014	0.000015
85	Tetrachloroethylene	0.08	0.00015	ND	ND	ND	ND	NA	NA	ND	ND	0.02	0.000038
86	Toluene	ND	ND	0.0	0.0	0.0	0.0	ND	ND	2.75	0.00084	0.69	0.00021
115	Arsenic	0.03	0.000053	0.02	0.000056	ND	ND	NA	NA	NA	-	0.02	0.000036
117	Beryllium	<0.014	<0.000025	0.0	0.0	0.02	0.000019	NA	NA	NA	-	0.01	0.000019
119	Chromium	<0.16	<0.00028	0.0	0.0	0.13	0.00013	NA	NA	NA	-	0.04	0.000043
120	Copper	0.24	0.00042	0.2	0.00056	0.072	0.000077	NA	NA	NA	-	0.17	0.00035
122	Lead	0.42	0.00074	0.0	0.0	0.76	0.00071	NA	NA	NA	-	0.39	0.00048
124	Nickel	<0.35	<0.00062	0.05	0.00014	0.55	0.00050	NA	NA	NA	-	0.20	0.00021
128	Zinc	0.033	0.000058	0.2	0.00056	0.061	0.000058	NA	NA	NA	-	0.098	0.00023

TABLE VII-6
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - DIRECT APPLICATION
PAGE 2

Treated Effluent

	Plant Code	105		106		304B		305A		313B	
	Reference No.	584F(04)		112B(01603-06)(4)		176(02)		176(02)		584B	
	Sample Points	F		(C/D+D)E		NA		D		D	
	Flow (gal/ton)	424		670		233		130		73(4)	
	C&TT Codes	NA, EB, SS		E, SS, FSP, NW, T		Central Treatment		Central Treatment		Skim Tank, CNT, OT	
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Total Suspended Solids	295	0.52	28	0.00039	No treated effluent samples taken at this plant.		NA	NA	NA	NA
	Oil & Grease	1,351	2.39	15	0.0027			NA	NA	NA	NA
	Dissolved Iron	167	0.30	NA	NA			NA	NA	NA	NA
	pH	3.3		NA				NA		NA	
6	Carbon Tetrachloride	0.04	0.000076	ND	ND			ND	ND		
11	1,1,1-Trichloroethane	0.2	0.00034	0.0	0.0			0.003	0.00066		
55	Naphthalene	ND	ND	0.0	0.0			ND	ND	ND	ND
78	Anthracene	ND	ND	0.0	0.0			ND	ND	ND	ND
85	Tetrachloroethylene	0.07	0.00013	0.0	0.0			ND	ND	ND	ND
86	Toluene	ND	ND	0.0	0.0			ND	ND	ND	ND
115	Arsenic	0.03	0.000055	0.0	0.0			NA	NA	ND	ND
117	Beryllium	<0.02	<0.000035	0.0	0.0			NA	NA	NA	NA
119	Chromium	<0.24	<0.00042	0.005	**			NA	NA	NA	NA
120	Copper	0.45	0.00080	0.018	**			NA	NA	NA	NA
122	Lead	<0.60	<0.0011	<0.05	**			NA	NA	NA	NA
124	Nickel	<0.50	<0.00088	<0.05	**			NA	NA	NA	NA
128	Zinc	0.68	0.0012	1.6	**			NA	NA	NA	NA

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(1) Some of the toxic organics data for Plant 304B are not included in the averages since the plant also later resampled as Plant 305A.
(2) Discharge goes to lagoons for further treatment.
(3) lbs/1000 lbs vales calculated. The values shown can not be derived from concentrations and flow value shown.
(4) Flow includes wastes from other sources and is not included in the average.

TABLE VII-7

SUMMARY OF LONG-TERM DATA COLD ROLLING

Plant Code:		0684F-03(1)				0920G-(01&02)			
C&TT:		EB,GF,SS				EB,GF,CL,SS,CNT			
Pollutants		No. of Samples	Max	Mean	Stand. Deviation	No. of Samples	Max	Mean	Stand. Deviation
	Total Suspended Solids	80	1,363	113	188	195	81.0	25.0	13.3
	Oil & Grease	79	147	17.7	22.0	268	66.0	19.2	9.6
	pH	1,206	13.6	10.0	0.9	58	2.7 to 8.0		
	Phenols	7	1.4	0.4	0.5	0	-	-	-
118	Cadmium	11	0.012	0.0069	0.0039	0	-	-	-
119	Chromium	11	0.13	0.044	0.037	0	-	-	-
120	Copper	11	0.13	0.071	0.037	0	-	-	-
121	Cyanide	7	0.063	0.029	0.020	0	-	-	-
122	Lead	11	1.16	0.059	0.039	0	-	-	-
124	Nickel	11	0.08	0.054	0.022	0	-	-	-
128	Zinc	78	80.0	4.6	10.6	0	-	-	-

---

(1) The wastestream receives additional treatment prior to discharge to a receiving stream.

TABLE VII-8

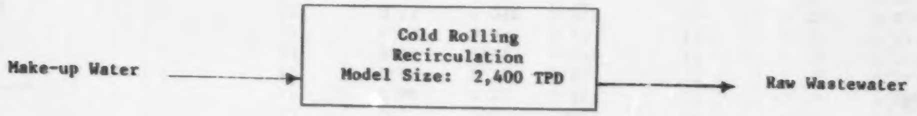
SUMMARY OF LONG TERM DATA
COLD ROLLING

Plant Code: 0684F-03
C&TT : EB, GF, SS

Pollutants	Raw Wastewater				Treated Effluent			
	No. of Observ.	Max	Mean	Standard Deviation	No. of Observ.	Max	Mean	Standard Deviation
Total Suspended Solids	-	-	-	-	104	66.0	15.79	11.17
Oil & Grease	-	-	-	-	105	21.0	7.30	4.30
004 Benzene	17	0.024	0.009	0.009	17	0.028	0.003	0.007
023 Chloroform	17	0.010	0.002	0.002	17	0.018	0.002	0.004
030 1,2-transdichloroethylene	1	0.097	0.097	0.0	1	0.130	0.130	0.0
034 2,4-dimethylene	1	0.032	0.032	0.0	0	-	-	-
038 Ethylbenzene	17	0.042	0.007	0.012	0	-	-	-
044 Methylene chloride	17	1.045	0.086	0.254	17	0.042	0.008	0.014
049 Trichlorofluoromethane	2	0.106	0.098	0.010	5	0.160	0.059	0.058
054 Isophorone	0	-	-	-	1	0.004	0.004	0.0
055 Napthalene	17	1.200	0.333	0.423	16	0.092	0.012	0.028
057 2-nitrophenol	0	-	-	-	16	0.013	0.002	0.003
058 4-nitrophenol	0	-	-	-	1	0.470	0.470	0.0
064 Pentachlorophenol	1	0.004	0.004	0.0	0	-	-	-
065 Phenol	17	0.920	0.255	0.275	16	0.770	0.093	0.219
066 bis-(2-ethyl hexyl) phthalate	17	4.80	0.706	1.518	16	0.016	0.002	0.004
070 Diethyl phthalate	0	-	-	-	16	0.270	0.178	0.059
071 Dimethyl phthalate	0	-	-	-	14	0.110	0.070	0.027
081 Phenanthrene	17	0.635	0.064	0.159	0	-	-	-
085 Tetrachloroethylene	17	2.50	0.355	0.679	17	0.150	0.035	0.049
086 Toluene	17	0.079	0.014	0.019	17	0.032	0.004	0.008
087 Trichloroethylene	17	0.037	0.006	0.012	17	0.010	0.002	0.002
117 Beryllium	17	0.010	0.0082	0.0034	17	0.01	0.0064	0.0029
118 Cadmium	17	0.051	0.018	0.014	17	0.036	0.016	0.010
119 Chromium	17	2.03	0.26	0.48	17	0.39	0.087	0.096
120 Copper	17	0.37	0.13	0.090	17	0.21	0.10	0.047
122 Lead	17	0.79	0.25	0.23	17	0.53	0.13	0.20
124 Nickel	17	1.05	0.42	0.23	17	0.51	0.20	0.18
128 Zinc	17	641	101.3	154.5	17	7.21	1.32	1.63
138 Manganese	17	0.84	0.27	0.21	17	0.35	0.088	0.083
142 Tin	17	3.18	1.14	1.04	17	2.11	0.14	0.51
165 Barium	17	0.35	0.18	0.073	17	0.13	0.059	0.032
166 Boron	17	1.03	0.43	0.25	17	0.77	0.27	0.21
167 Cobalt	17	0.13	0.052	0.035	17	0.105	0.034	0.037
168 Molybdenum	17	0.72	0.22	0.25	17	1.33	0.29	0.46
169 Titanium	17	0.070	0.023	0.017	17	0.084	0.024	0.027
170 Vanadium	17	0.17	0.068	0.054	17	0.15	0.062	0.052

TABLE VII-9

NET CONCENTRATION AND LOAD ANALYSIS
COLD FORMING: COLD ROLLING - RECIRCULATION MULTI STAND


Make-up Water
Cold Rolling
Recirculation
Model Size: 2,400 TPD
Raw Wastewater

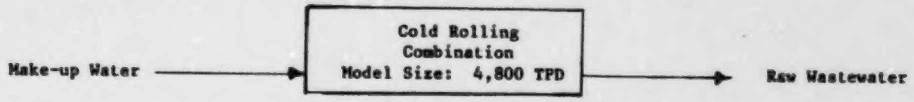
2,400 TPD x 25 GPD = 60,000 GPD

2,400 TPD x 25 GPT = 60,000 GPD

Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	<5.0	6.7	4.6	2.30	15,000	7,506	0.031
Total Suspended Solids	0.80	6.0	2.6	1.30	940	470.4	0.28
55 Napthalene	ND	<0.010	0.0	0.0	1.7	0.85	0.0
85 Tetrachloroethylene	ND	<0.010	0.0	0.0	0.060	0.030	0.0
119 Chromium	0.019	0.037	0.018	0.009	2.5	1.25	0.72
122 Lead	0.030	0.074	0.035	0.018	2.9	1.45	1.24
124 Nickel	<0.025	0.22	0.11	0.055	3.3	1.65	3.33
128 Zinc	0.013	0.033	0.017	0.009	3.7	1.85	0.49

TABLE VII-10

NET CONCENTRATION AND LOAD ANALYSIS
COLD FORMING: COLD ROLLING - COMBINATION


Make-up Water
Cold Rolling
Combination
Model Size: 4,800 TPD
Raw Wastewater

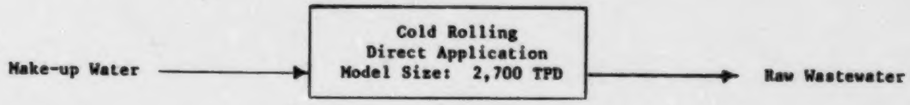
4,800 TPD x 300 GPT = 1.44 MGD

4,800 TPD x 300 GPT = 1.44 MGD

Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	<5.0	6.7	4.6	55.24	1,200	14,412	0.38
Total Suspended Solids	0.80	6.0	2.6	31.22	620	7,446	0.42
55 Napthalene	ND	<0.010	0.0	0.0	2.9	34.83	0.0
85 Tetrachloroethylene	ND	<0.010	0.0	0.0	<0.010	0.12	0.0
119 Chromium	0.019	0.037	0.018	0.22	0.030	0.36	61.11
122 Lead	0.030	0.074	0.035	0.42	<0.010	0.12	350.00
124 Nickel	<0.025	0.22	0.11	1.32	0.20	2.40	55.00
128 Zinc	0.013	0.033	0.017	0.20	0.20	2.40	8.33

TABLE VII-11

NET CONCENTRATION AND LOAD ANALYSIS
COLD FORMING: COLD ROLLING - DIRECT APPLICATION MULTI STAND


Make-up Water
Cold Rolling
Direct Application
Model Size: 2,700 TPD
Raw Wastewater

2,700 TPD x 400 GPT = 1.1 MGD

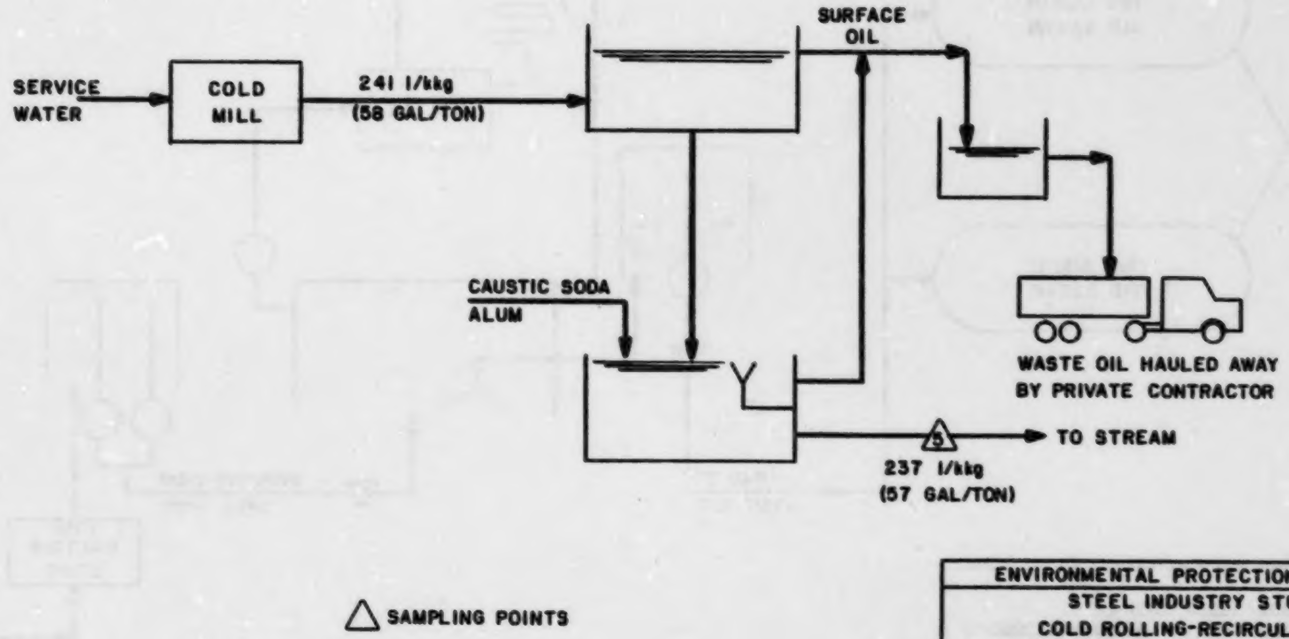
2,700 TPD x 400 GPT = 1.1 MGD

Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	<5.0	<5.0	<5.0	45.04	1,200	10,809	0.42
Total Suspended Solids	0.80	0.80	0.80	7.21	140	1,261	0.57
55 Napthalene	ND	ND	ND	0.0	<0.010	0.090	0.0
85 Tetrachloroethylene	ND	ND	ND	0.0	0.030	0.27	0.0
119 Chromium	0.019	0.019	0.019	0.17	0.10	0.90	18.89
122 Lead	0.030	0.030	0.030	0.27	0.40	3.60	7.50
124 Nickel	<0.025	<0.025	<0.025	0.23	0.30	2.70	8.52
128 Zinc	0.033	0.033	0.033	0.30	<0.010	0.090	333.33

PROCESS: COLD ROLLING-RECIRCULATION

PLANT: D

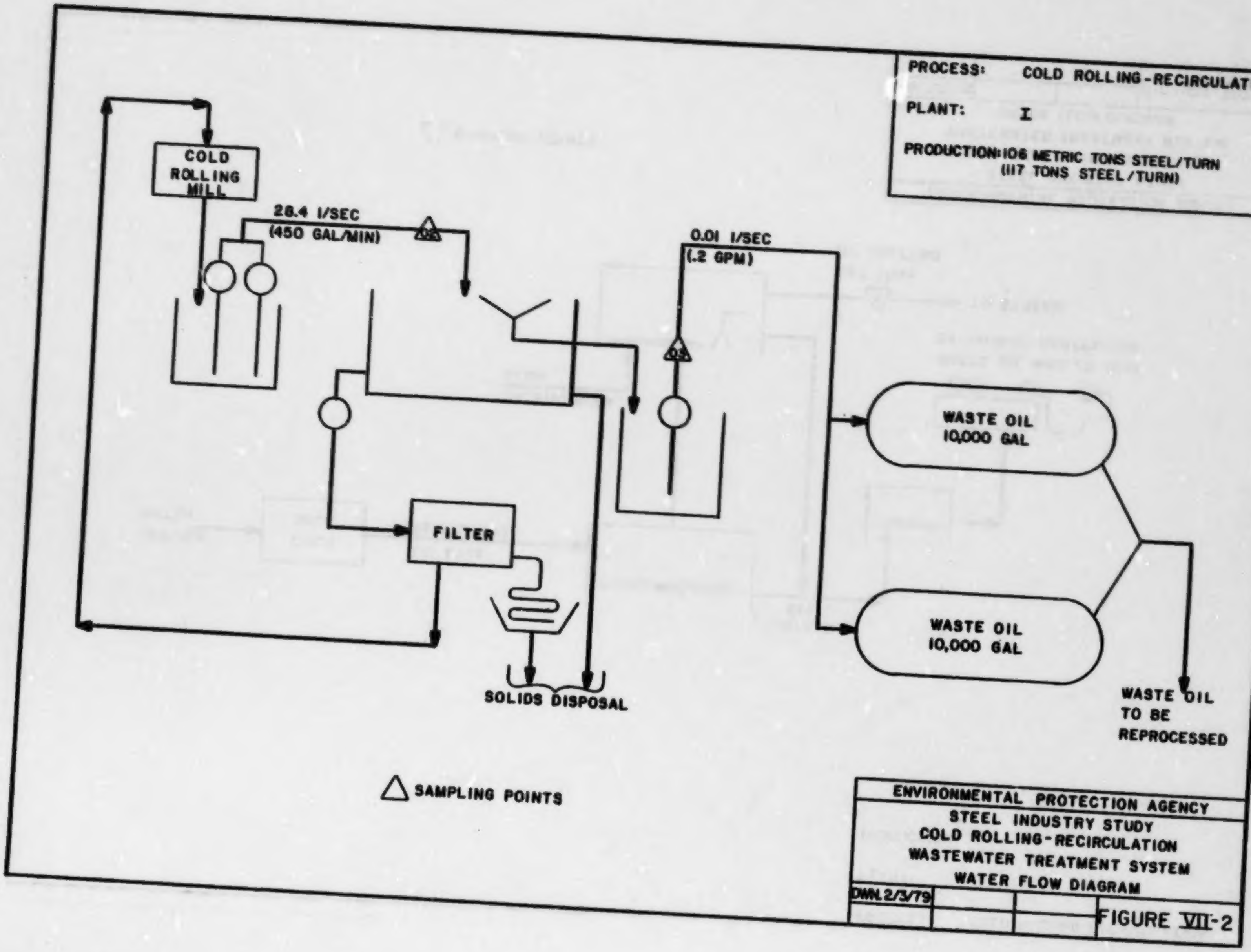
PRODUCTION:


SERVICE WATER
COLD MILL
241 l/kkg
(58 GAL/TON)
SURFACE OIL
CAUSTIC SODA
ALUM
5
TO STREAM
237 l/kkg
(57 GAL/TON)
WASTE OIL HAULED AWAY BY PRIVATE CONTRACTOR
SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWN. 2/2/79

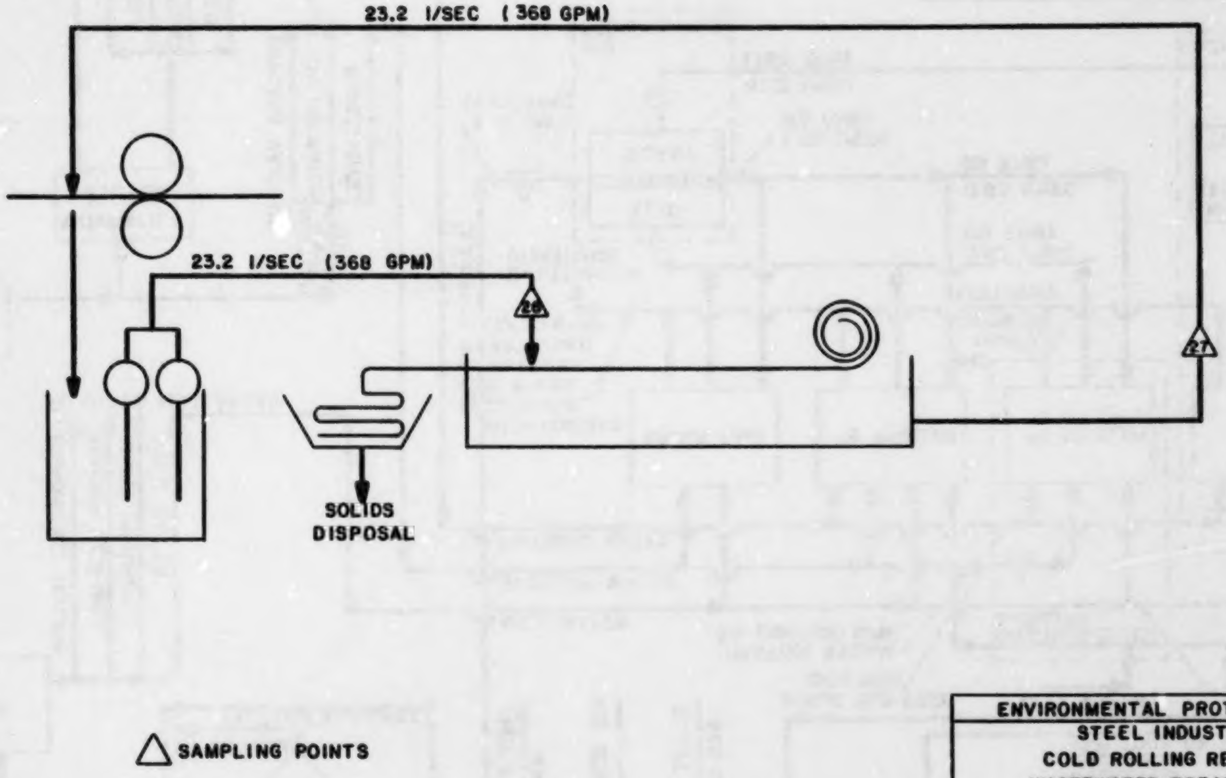
FIGURE VII-1


PROCESS: COLD ROLLING-RECIRCULATION
PLANT: I
PRODUCTION: 106 METRIC TONS STEEL/TURN
(117 TONS STEEL/TURN)
COLD ROLLING MILL
28.4 l/SEC
(450 GAL/MIN)
0.01 l/SEC
(.2 GPM)
FILTER
SOLIDS DISPOSAL
WASTE OIL 10,000 GAL
WASTE OIL 10,000 GAL
WASTE OIL TO BE REPROCESSED
△ SAMPLING POINTS
DWN. 2/3/79

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-2

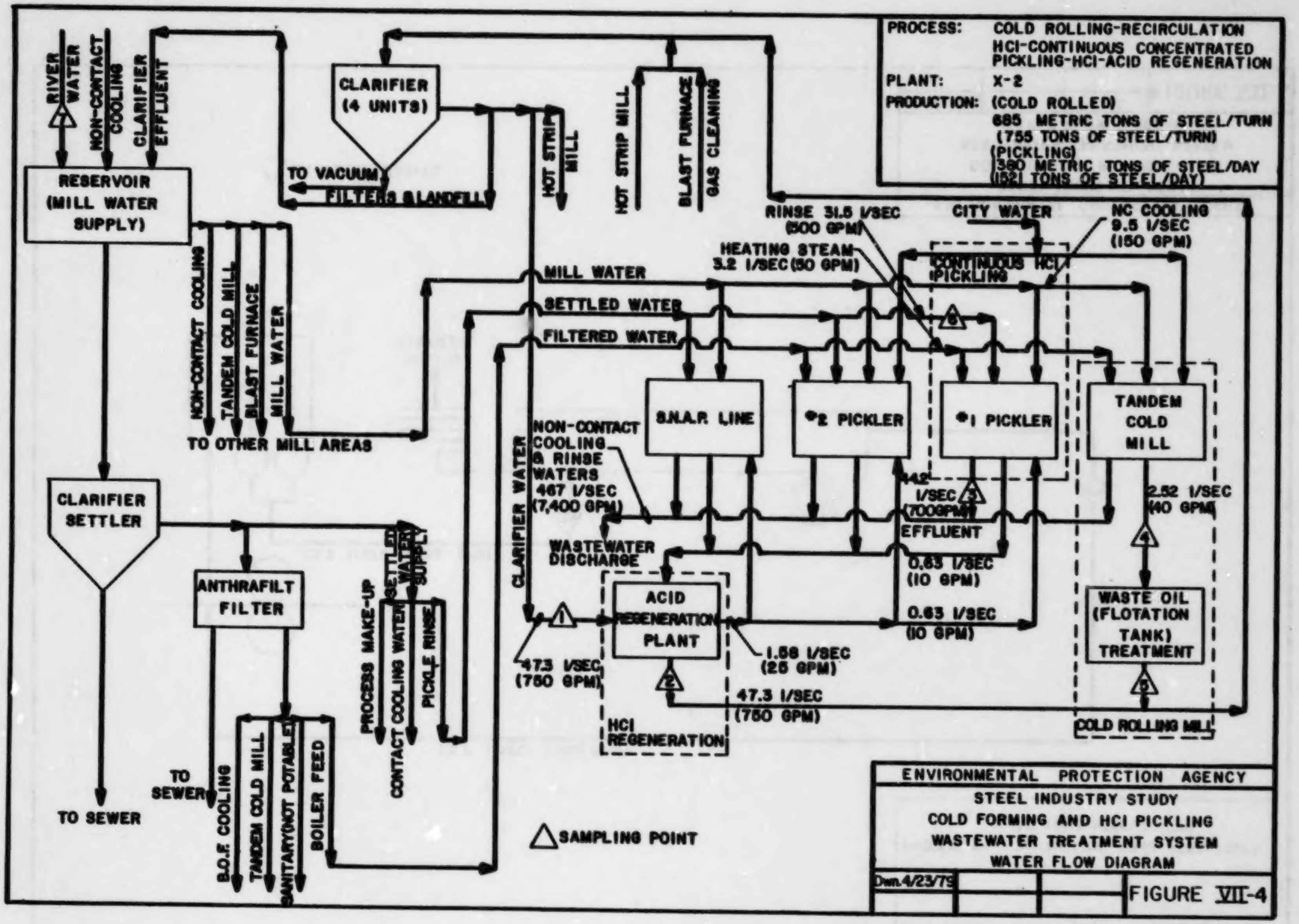
PROCESS: COLD ROLLING-RECIRCULATION
PLANT: P
PRODUCTION 9.1 METRIC TONS STEEL/TURN
(10 TONS STEEL/TURN)


23.2 l/SEC (368 GPM)
23.2 l/SEC (368 GPM)
28
27
SOLIDS DISPOSAL
SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

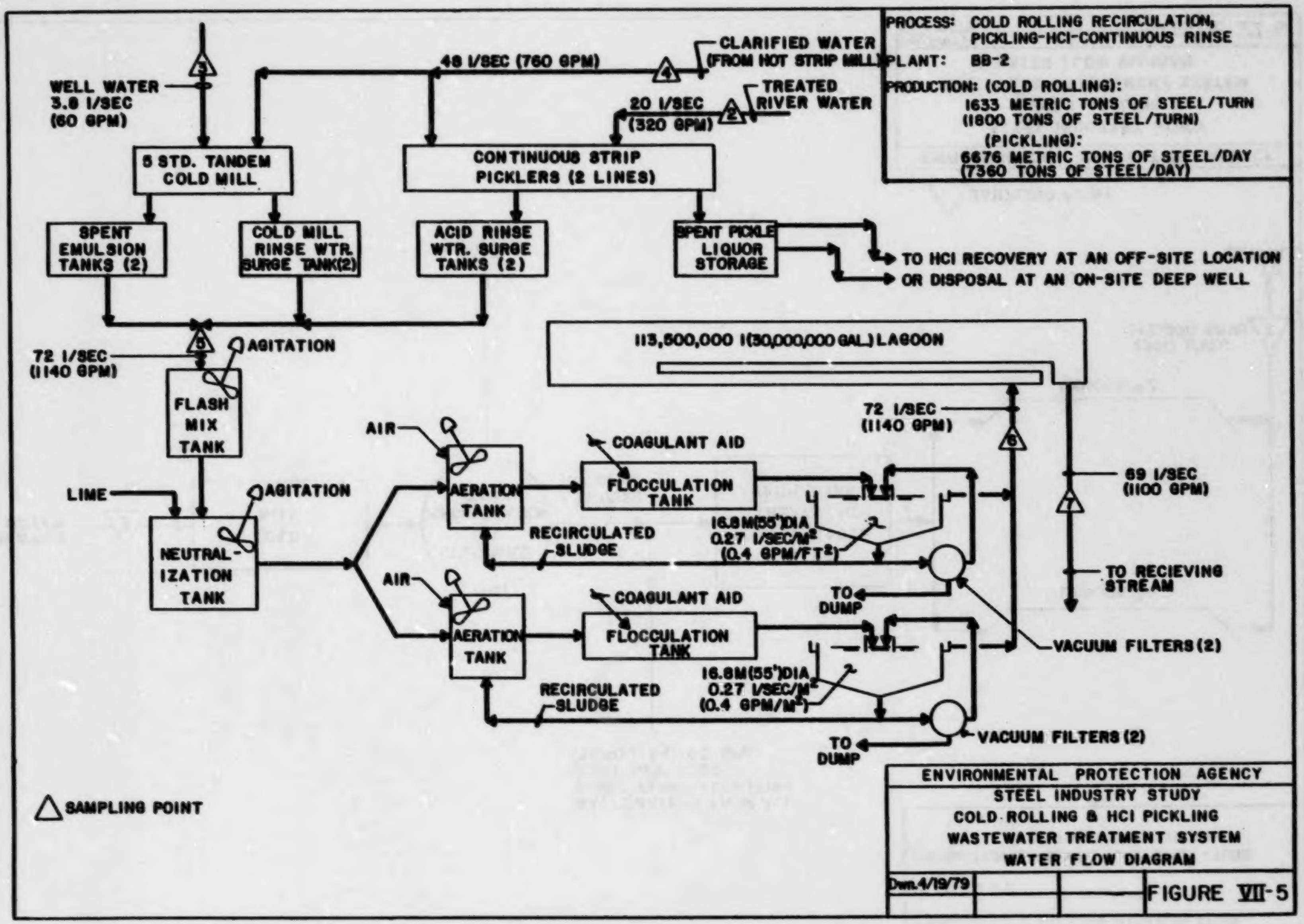
DWN. 2/3/79

FIGURE VII-3


RIVER WATER
NON-CONTACT COOLING
CLARIFIER EFFLUENT
RESERVOIR (MILL WATER SUPPLY)
NON-CONTACT COOLING
TANDEM COLD MILL
BLAST FURNACE
MILL WATER
TO OTHER MILL AREAS
CLARIFIER (4 UNITS)
TO VACUUM FILTERS & LANDFILL
HOT STRIP MILL
HOT STRIP MILL
BLAST FURNACE
GAS CLEANING
MILL WATER
SETTLED WATER
FILTERED WATER
CLARIFIER WATER
RINSE 31.5 l/SEC (500 GPM)
HEATING STEAM 3.2 l/SEC (50 GPM)
CITY WATER
NC COOLING 9.5 l/SEC (150 GPM)
CONTINUOUS HCl PICKLING
S.N.A.P. LINE
#2 PICKLER
#1 PICKLER
TANDEM COLD MILL
NON-CONTACT COOLING & RINSE WATERS 467 l/SEC (7,400 GPM)
442 l/SEC (7000GPM)
EFFLUENT
WASTEWATER DISCHARGE
0.63 l/SEC (10 GPM)
0.63 l/SEC (10 GPM)
2.52 l/SEC (40 GPM)
WASTE OIL (FLOTATION TANK) TREATMENT
COLD ROLLING MILL
ACID REGENERATION PLANT
HCl REGENERATION
47.3 l/SEC (750 GPM)
1.58 l/SEC (25 GPM)
47.3 l/SEC (750 GPM)
1
2
3
4
5
6
CLARIFIER SETTLER
TO SEWER
ANTHRAFILT FILTER
TO SEWER
B.O.F. COOLING
TANDEM COLD MILL
SANITARY(NOT POTABLE)
BOILER FEED
SETTLED WATER SUPPLY
PROCESS MAKE-UP
CONTACT COOLING WATER
PICKLE RINSE
△ SAMPLING POINT

PROCESS: COLD ROLLING-RECIRCULATION
HCl-CONTINUOUS CONCENTRATED
PICKLING-HCl-ACID REGENERATION
PLANT: X-2
PRODUCTION: (COLD ROLLED)
685 METRIC TONS OF STEEL/TURN
(755 TONS OF STEEL/TURN)
(PICKLING)
360 METRIC TONS OF STEEL/DAY
(521 TONS OF STEEL/DAY)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING AND HCl PICKLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM
Dwn. 4/23/79
FIGURE VII-4


PROCESS: COLD ROLLING RECIRCULATION, PICKLING-HCl-CONTINUOUS RINSE
PLANT: BB-2
PRODUCTION: (COLD ROLLING):
1633 METRIC TONS OF STEEL/TURN
(1800 TONS OF STEEL/TURN)
(PICKLING):
6676 METRIC TONS OF STEEL/DAY
(7360 TONS OF STEEL/DAY)
WELL WATER 3.8 l/SEC (60 GPM)
3
48 l/SEC (760 GPM)
4
CLARIFIED WATER (FROM HOT STRIP MILL)
20 l/SEC (320 GPM)
2
TREATED RIVER WATER
5 STD. TANDEM COLD MILL
CONTINUOUS STRIP PICKLERS (2 LINES)
SPENT EMULSION TANKS (2)
COLD MILL RINSE WTR. SURGE TANK(2)
ACID RINSE WTR. SURGE TANKS (2)
SPENT PICKLE LIQUOR STORAGE
TO HCl RECOVERY AT AN OFF-SITE LOCATION
OR DISPOSAL AT AN ON-SITE DEEP WELL
113,500,000 l (30,000,000 GAL) LAGOON
5
72 l/SEC (1140 GPM)
AGITATION
FLASH MIX TANK
LIME
AGITATION
NEUTRAL-IZATION TANK
AIR
AERATION TANK
COAGULANT AID
FLOCCULATION TANK
RECIRCULATED SLUDGE
16.8M(55')DIA
0.27 l/SEC/M²
(0.4 GPM/FT²)
TO DUMP
AIR
AERATION TANK
COAGULANT AID
FLOCCULATION TANK
RECIRCULATED SLUDGE
16.8M(55')DIA
0.27 l/SEC/M²
(0.4 GPM/M²)
TO DUMP
VACUUM FILTERS (2)
VACUUM FILTERS (2)
72 l/SEC (1140 GPM)
6
69 l/SEC (1100 GPM)
7
TO RECIEVING STREAM
△ SAMPLING POINT
Dwn.4/19/79

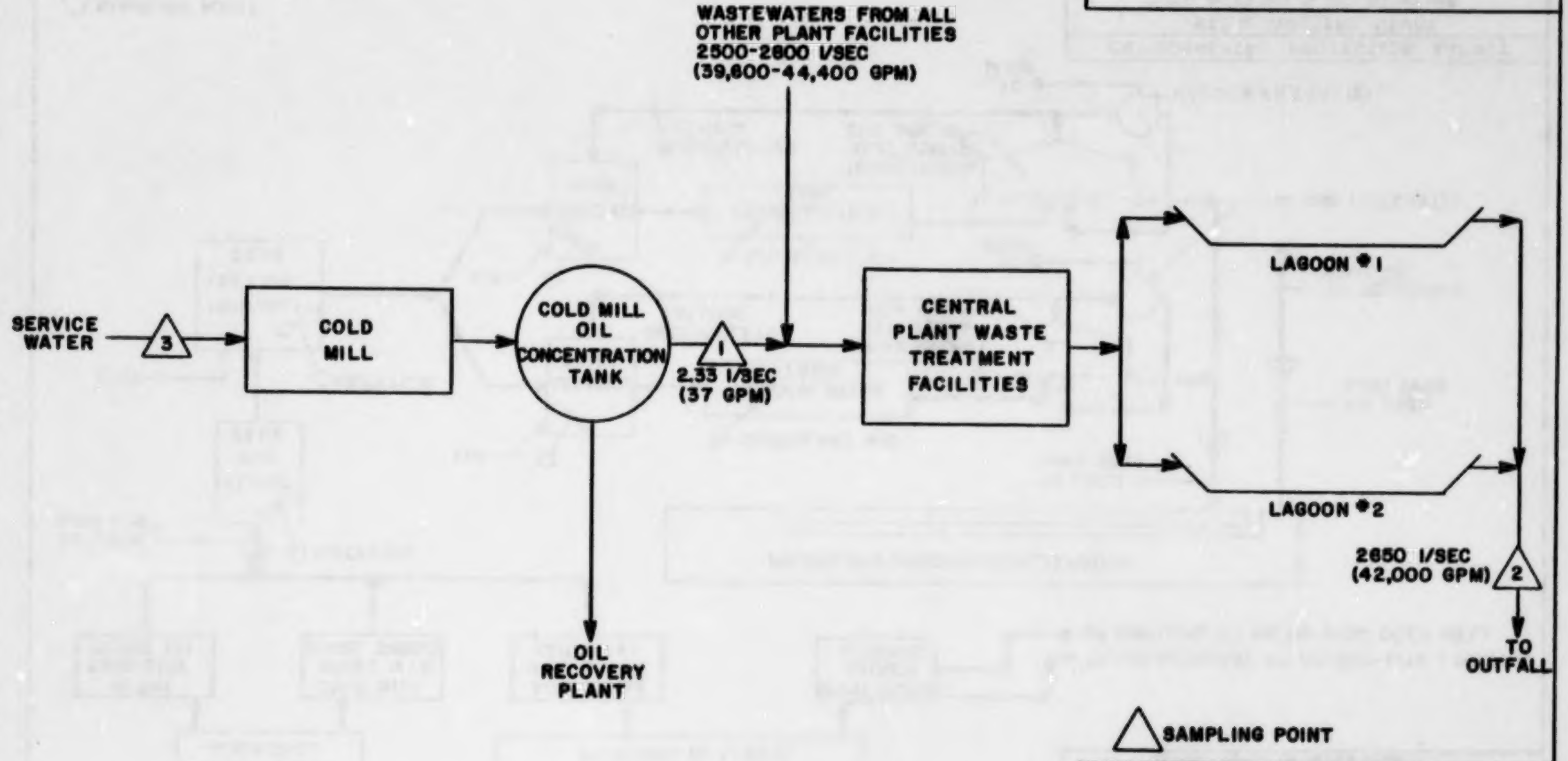
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING & HCl PICKLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-5

PROCESS: COLD ROLLING-RECIRCULATION

PLANT: EE-2

PRODUCTION: 935 METRIC TONS STEEL/TURN
(1030 TONS STEEL/TURN)


WASTEWATERS FROM ALL OTHER PLANT FACILITIES 2500-2800 l/SEC (39,600-44,400 GPM)
SERVICE WATER
3
COLD MILL
COLD MILL OIL CONCENTRATION TANK
1
2.33 l/SEC (37 GPM)
CENTRAL PLANT WASTE TREATMENT FACILITIES
LAGOON #1
LAGOON #2
2650 l/SEC (42,000 GPM)
2
TO OUTFALL
OIL RECOVERY PLANT
SAMPLING POINT

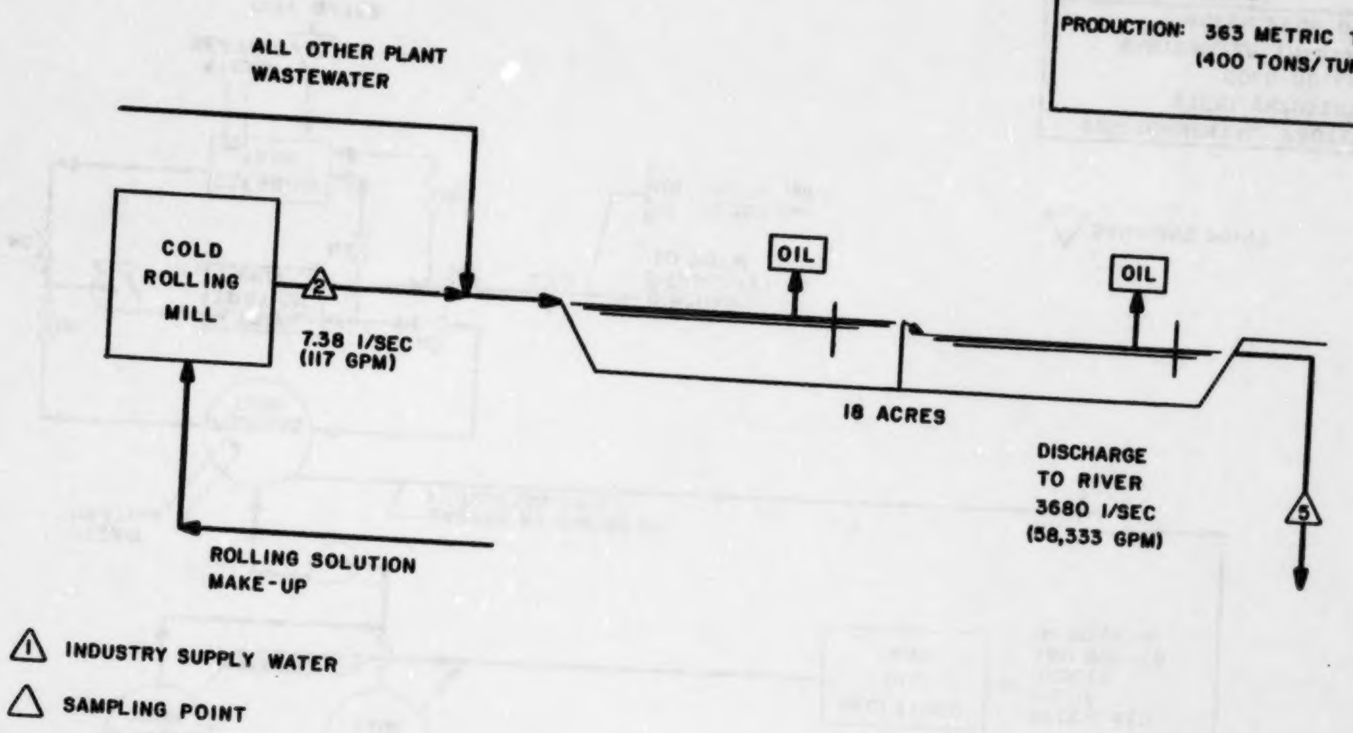
ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwg.6/6/75
Rev.2/20/76

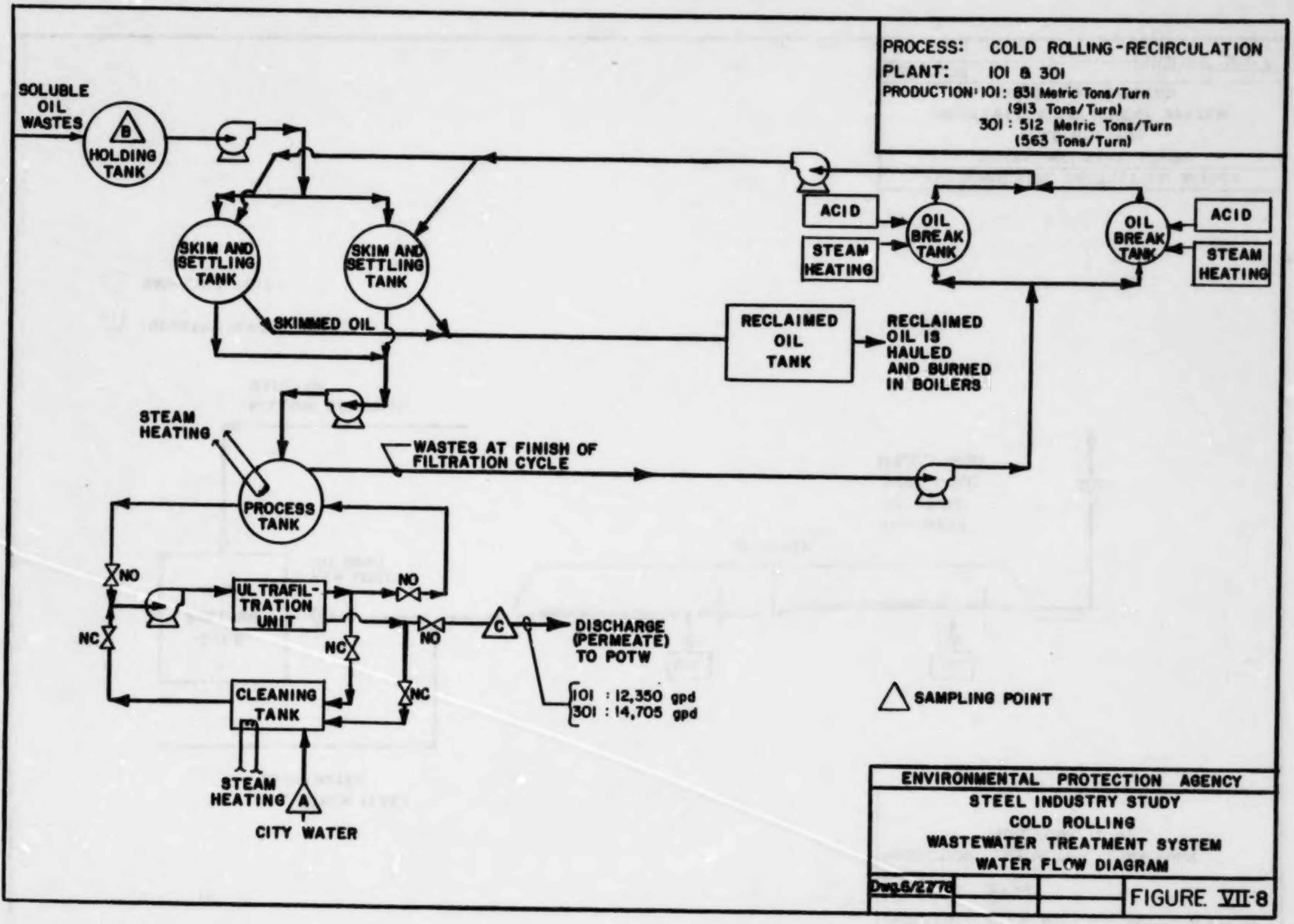
FIGURE VII-6

PROCESS: COLD ROLLING-RECIRCULATION
PLANT: XX-2
PRODUCTION: 363 METRIC TONS/TURN
(400 TONS/TURN)


ALL OTHER PLANT WASTEWATER
COLD ROLLING MILL
2
7.38 l/SEC (117 GPM)
ROLLING SOLUTION MAKE-UP
OIL
OIL
18 ACRES
DISCHARGE TO RIVER 3680 l/SEC (58,333 GPM)
5
1 INDUSTRY SUPPLY WATER
SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM
DWN.2/2/79
FIGURE VII-7

)

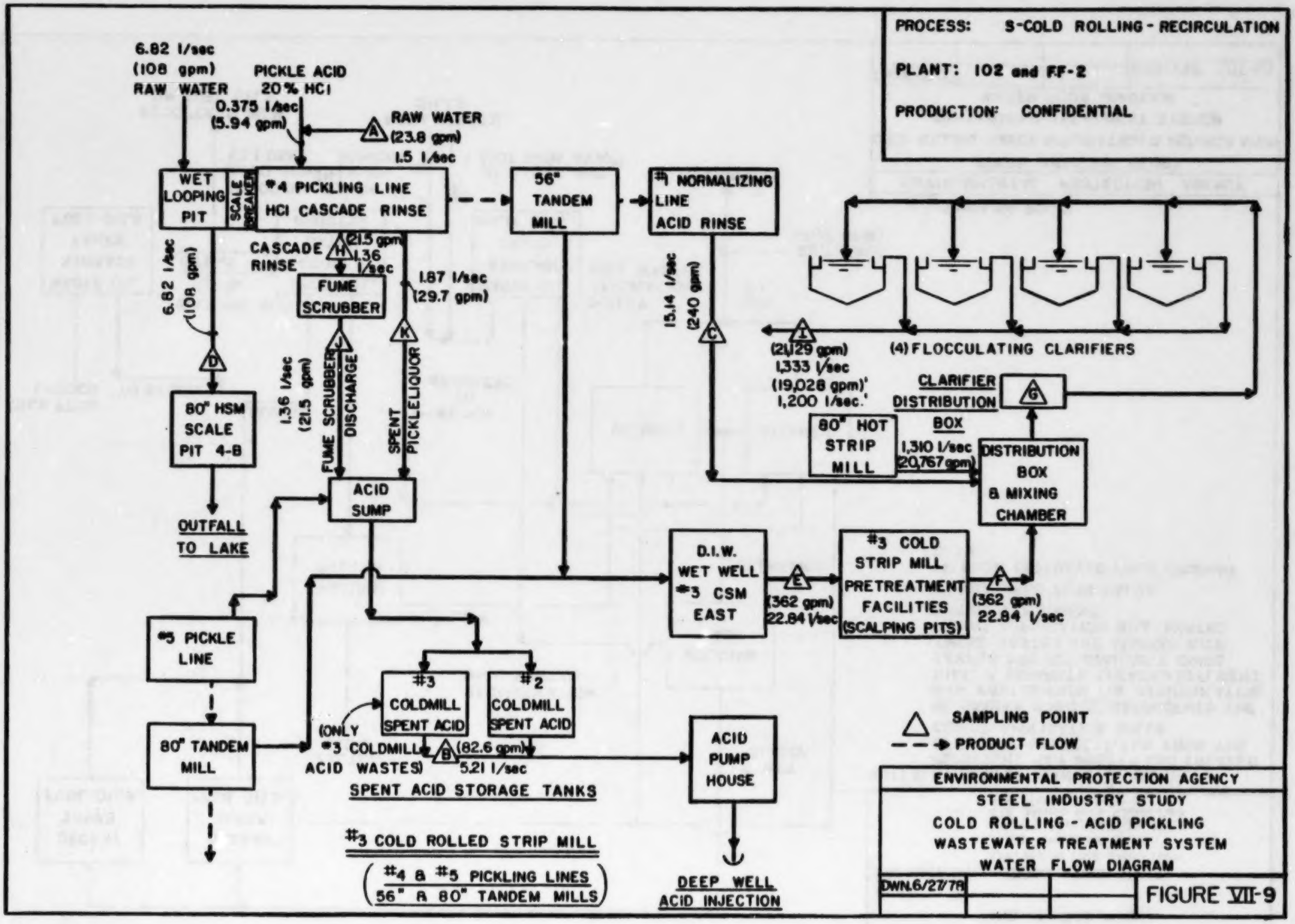

SOLUBLE OIL WASTES
B
HOLDING TANK
SKIM AND SETTLING TANK
SKIM AND SETTLING TANK
SKIMMED OIL
ACID
STEAM HEATING
OIL BREAK TANK
OIL BREAK TANK
ACID
STEAM HEATING
RECLAIMED OIL TANK
RECLAIMED OIL IS HAULED AND BURNED IN BOILERS
STEAM HEATING
WASTES AT FINISH OF FILTRATION CYCLE
PROCESS TANK
NO
NC
ULTRAFIL-TRATION UNIT
NO
NC
NO
NC
C
DISCHARGE (PERMEATE) TO POTW
101 : 12,350 gpd
301 : 14,705 gpd
CLEANING TANK
STEAM HEATING
A
CITY WATER
SAMPLING POINT

PROCESS: COLD ROLLING-RECIRCULATION
PLANT: 101 & 301
PRODUCTION: 101: 831 Metric Tons/Turn
(913 Tons/Turn)
301 : 512 Metric Tons/Turn
(563 Tons/Turn)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

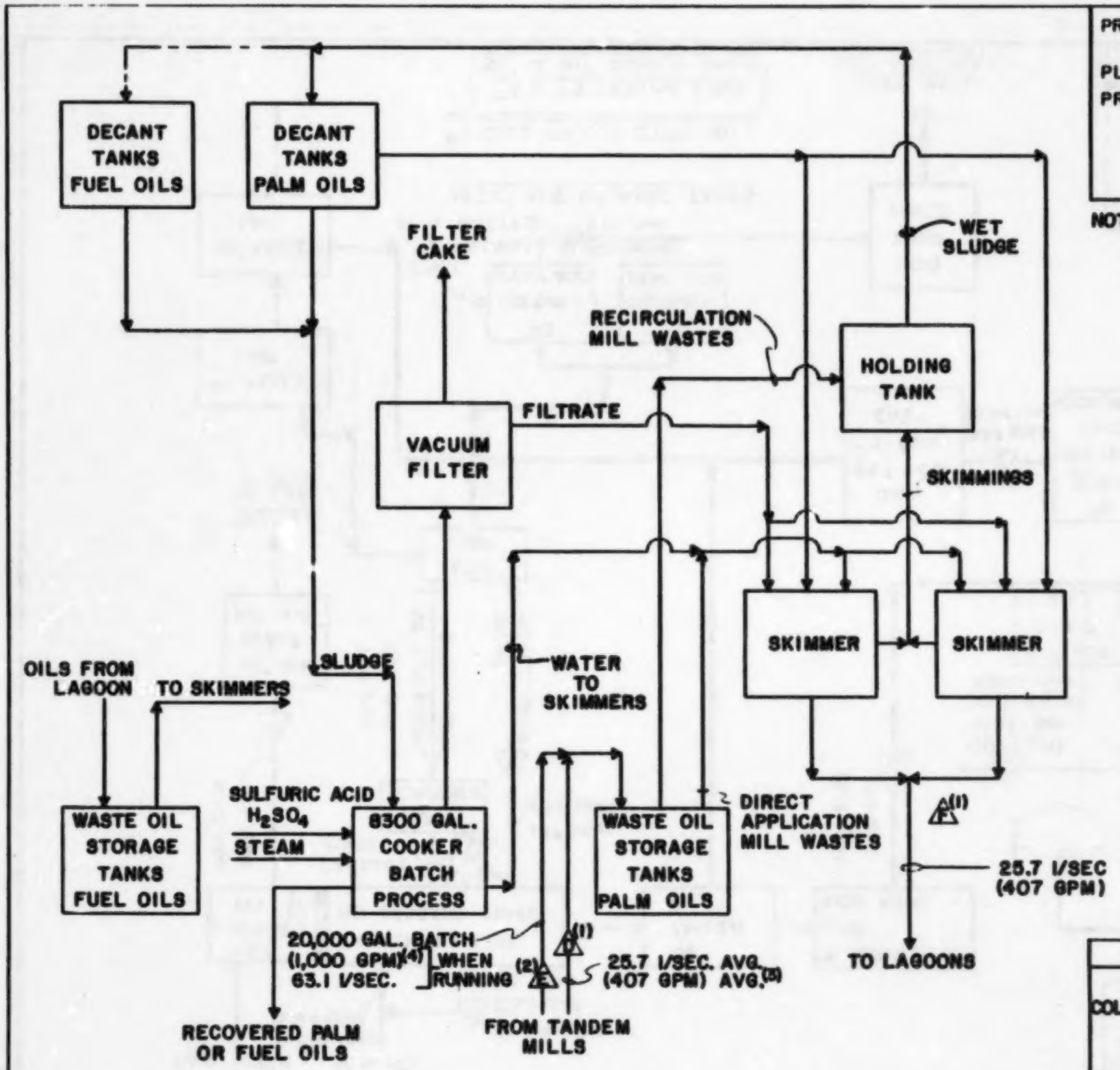
Dwg.6/2776

FIGURE VII-8


PROCESS: S-COLD ROLLING - RECIRCULATION
PLANT: 102 and FF-2
PRODUCTION: CONFIDENTIAL
6.82 l/sec
(108 gpm)
RAW WATER
PICKLE ACID
20% HCl
0.375 l/sec
(5.94 gpm)
A
RAW WATER
(23.8 gpm)
1.5 l/sec
WET LOOPING PIT
SCALE BREAKER
#4 PICKLING LINE
HCl CASCADE RINSE
56" TANDEM MILL
#1 NORMALIZING LINE ACID RINSE
CASCADE RINSE
H
(21.5 gpm)
1.36 l/sec
1.87 l/sec
(29.7 gpm)
FUME SCRUBBER
6.82 l/sec
(108 gpm)
D
80" HSM SCALE PIT 4-B
OUTFALL TO LAKE
1.36 l/sec
(21.5 gpm)
J
FUME SCRUBBER DISCHARGE
K
SPENT PICKLELIQUOR
ACID SUMP
15.14 l/sec
(240 gpm)
C
I
(21,129 gpm)
1,333 l/sec
(19,028 gpm)'
1,200 l/sec.'
(4) FLOCCULATING CLARIFIERS
CLARIFIER DISTRIBUTION BOX
G
80" HOT STRIP MILL
1,310 l/sec
20,767 gpm)
DISTRIBUTION BOX & MIXING CHAMBER
D.I.W. WET WELL #3 CSM EAST
E
(362 gpm)
22.84 l/sec
#3 COLD STRIP MILL PRETREATMENT FACILITIES (SCALPING PITS)
F
(362 gpm)
22.84 l/sec
#5 PICKLE LINE
80" TANDEM MILL
#3 COLDMILL SPENT ACID
#2 COLDMILL SPENT ACID
(ONLY #3 COLDMILL ACID WASTES)
B
(82.6 gpm)
5.21 l/sec
SPENT ACID STORAGE TANKS
ACID PUMP HOUSE
DEEP WELL ACID INJECTION
#3 COLD ROLLED STRIP MILL
(#4 & #5 PICKLING LINES
56" & 80" TANDEM MILLS)
SAMPLING POINT
PRODUCT FLOW
DWN.6/27/78

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING - ACID PICKLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-9


DECANT TANKS FUEL OILS
DECANT TANKS PALM OILS
FILTER CAKE
RECIRCULATION MILL WASTES
HOLDING TANK
WET SLUDGE
VACUUM FILTER
FILTRATE
SKIMMINGS
SKIMMER
SKIMMER
OILS FROM LAGOON
TO SKIMMERS
SLUDGE
WATER TO SKIMMERS
SULFURIC ACID H_2SO_4
STEAM
WASTE OIL STORAGE TANKS FUEL OILS
8300 GAL. COOKER BATCH PROCESS
WASTE OIL STORAGE TANKS PALM OILS
DIRECT APPLICATION MILL WASTES
△F (1)
25.7 l/SEC (407 GPM)
20,000 GAL. BATCH (1,000 GPM)(4) 63.1 l/SEC. WHEN RUNNING
(2) △E
△D (1)
25.7 l/SEC. AVG. (407 GPM) AVG.(3)
FROM TANDEM MILLS
RECOVERED PALM OR FUEL OILS
TO LAGOONS

PROCESS: COLD ROLLING-DIRECT APPLICATION AND RECIRCULATION

PLANT: 105

PRODUCTION: RECIRCULATING MILLS
1060 Metric Tons Steel/Turn
(1169 Tons Steel/Turn)
DIRECT APPLICATION MILL
418 Metric Tons Steel/Turn
(461 Tons Steel/Turn)

NOTES: (1) SAMPLE POINTS △D AND △F REPRESENT RAW WASTES AND TREATED EFFLUENT, RESPECTIVELY, FROM THE DIRECT APPLICATION MILLS.

(2) SAMPLE POINT △E REPRESENTS THE RAW WASTES FROM THE RECIRCULATION MILL. A SEPARATE TREATED EFFLUENT SAMPLE WAS NOT AVAILABLE SINCE THESE WASTES ARE ADMIXED WITH DIRECT APPLICATION MILL WASTES DURING TREATMENT.

(3) MEASURED FLOW VALVE

(4) FLOW ESTIMATED FROM COMPANY DATA.

△ SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING-DIRECT APPLICATION & RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

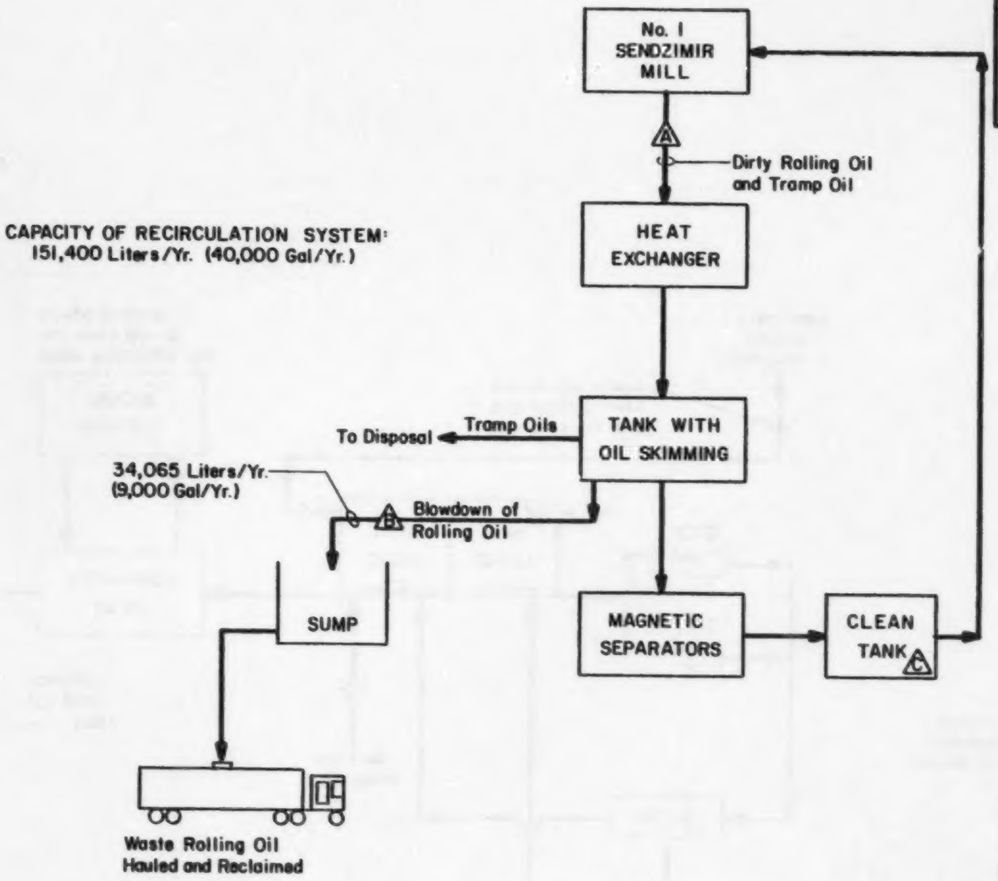
Dwg.8/10/77

FIGURE VII-10

PROCESS: Cold Rolling-Recirculation

PLANT: 302

PRODUCTION: 137 Metric Tons/Turn
(151 Tons/Turn)


No. 1
SENDZIMIR
MILL
A
Dirty Rolling Oil
and Tramp Oil
HEAT
EXCHANGER
CAPACITY OF RECIRCULATION SYSTEM:
151,400 Liters/Yr. (40,000 Gal/Yr.)
TANK WITH
OIL SKIMMING
Tramp Oils
To Disposal
34,065 Liters/Yr.
(9,000 Gal/Yr.)
B
Blowdown of
Rolling Oil
SUMP
MAGNETIC
SEPARATORS
CLEAN
TANK
C
Waste Rolling Oil
Hauled and Reclaimed

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 1/11/82

FIGURE VII-11

PROCESS: Cold Rolling-Recirculation and Direct Application

PLANT: 304A & B and 305A & B

304A & B

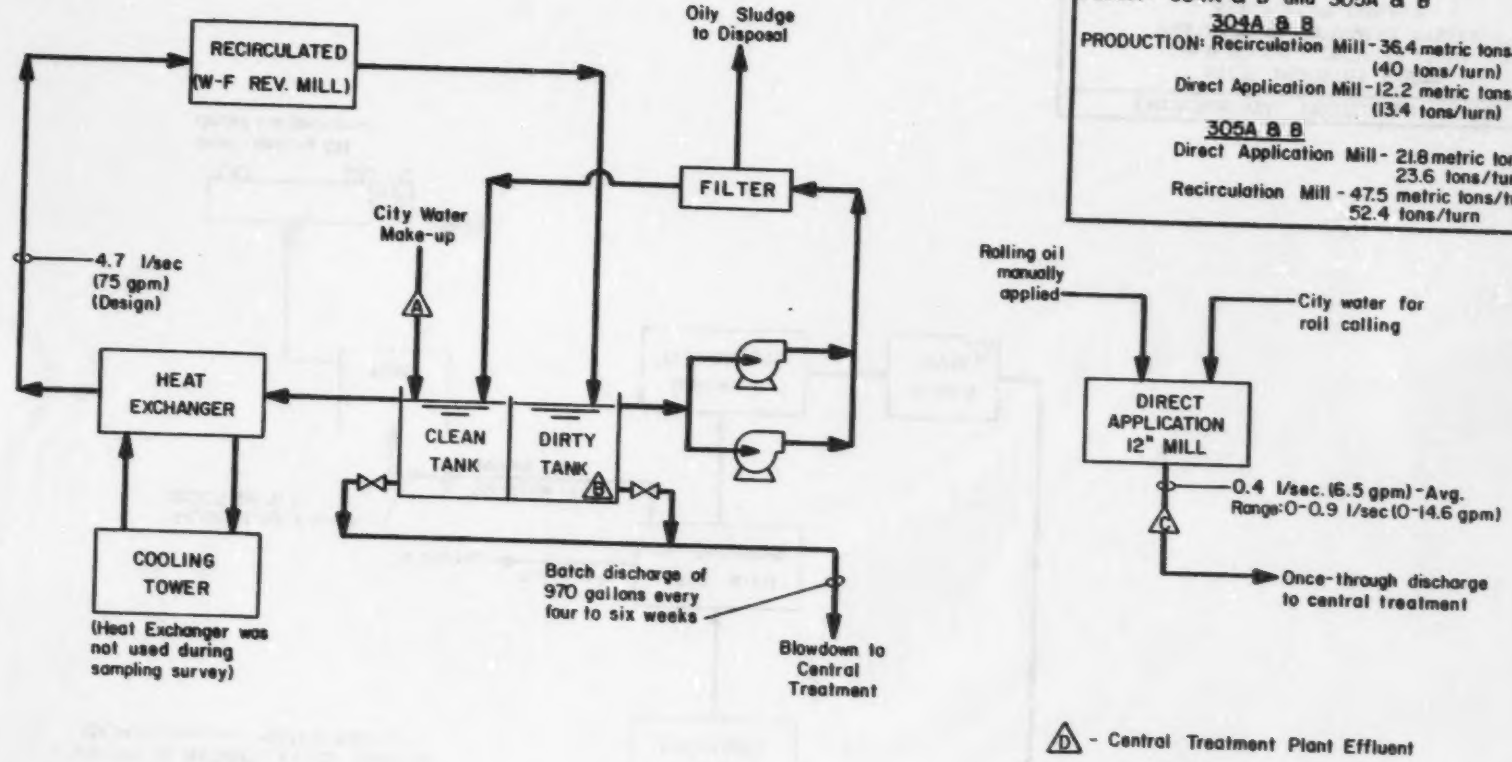
PRODUCTION: Recirculation Mill - 36.4 metric tons/turn (40 tons/turn)

Direct Application Mill - 12.2 metric tons/turn (13.4 tons/turn)

305A & B

Direct Application Mill - 21.8 metric tons/turn 23.6 tons/turn

Recirculation Mill - 47.5 metric tons/turn 52.4 tons/turn



Oily Sludge to Disposal
RECIRCULATED (W-F REV. MILL)
FILTER
City Water Make-up
A
4.7 l/sec (75 gpm) (Design)
HEAT EXCHANGER
CLEAN TANK
DIRTY TANK
B
COOLING TOWER
(Heat Exchanger was not used during sampling survey)
Batch discharge of 970 gallons every four to six weeks
Blowdown to Central Treatment
Rolling oil manually applied
City water for roll calling
DIRECT APPLICATION 12" MILL
0.4 l/sec. (6.5 gpm) - Avg. Range: 0-0.9 l/sec (0-14.6 gpm)
C
Once-through discharge to central treatment
D - Central Treatment Plant Effluent

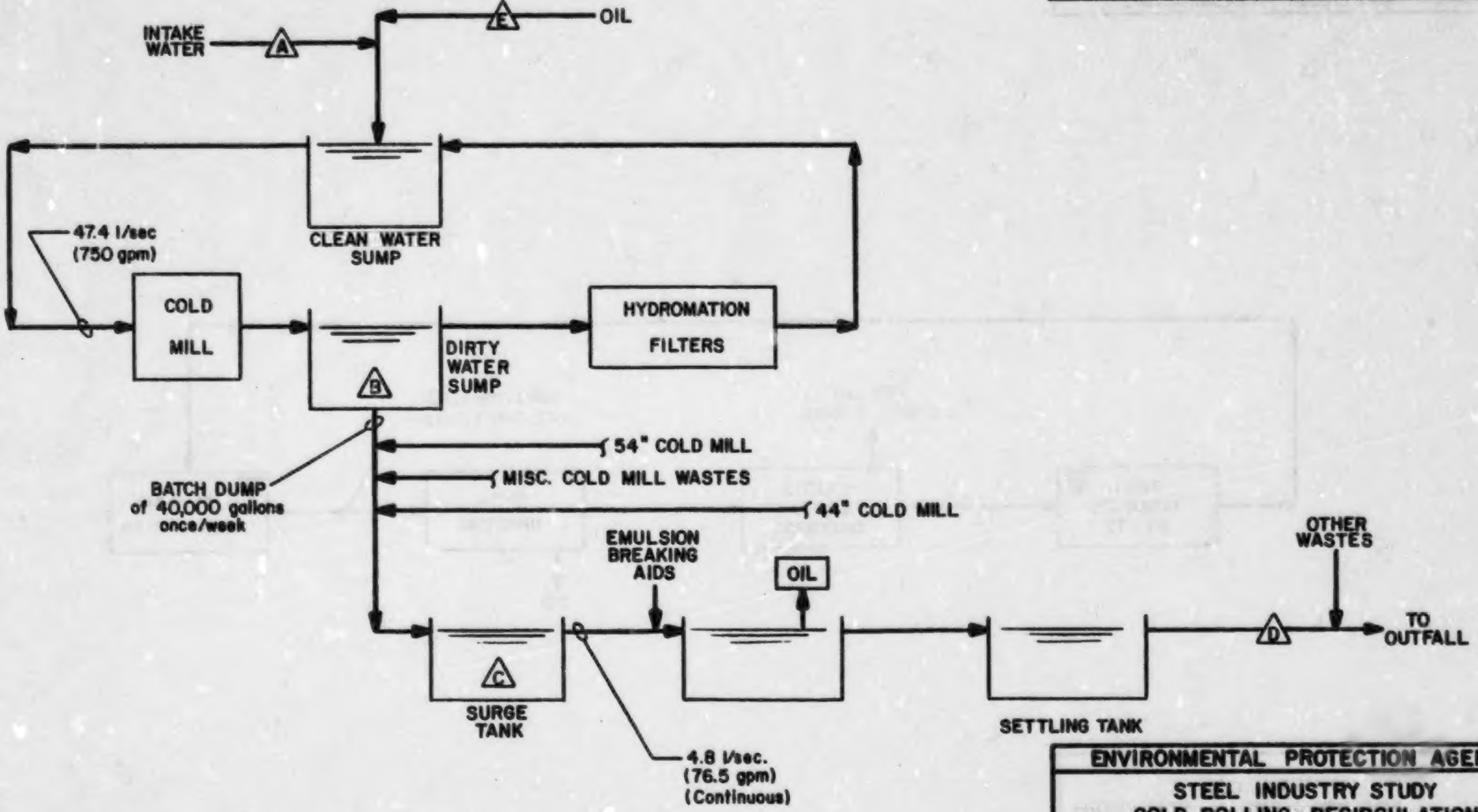
ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION & DIRECT APPLICATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 6/27/80

FIGURE VII-12

PROCESS: COLD ROLLING RECIRCULATION
PLANT: 306 and 307
PRODUCTION:
306: 496 Metric Tons/Turn
(545 Tons/Turns)
307: 417 Metric Tons/Turn
(460 Tons/Tarn)


INTAKE WATER
A
E
OIL
CLEAN WATER SUMP
47.4 l/sec (750 gpm)
COLD MILL
DIRTY WATER SUMP
B
HYDROMATION FILTERS
54" COLD MILL
MISC. COLD MILL WASTES
44" COLD MILL
BATCH DUMP of 40,000 gallons once/week
EMULSION BREAKING AIDS
OIL
OTHER WASTES
C
SURGE TANK
4.8 l/sec. (76.5 gpm) (Continuous)
SETTLING TANK
D
TO OUTFALL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING - RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

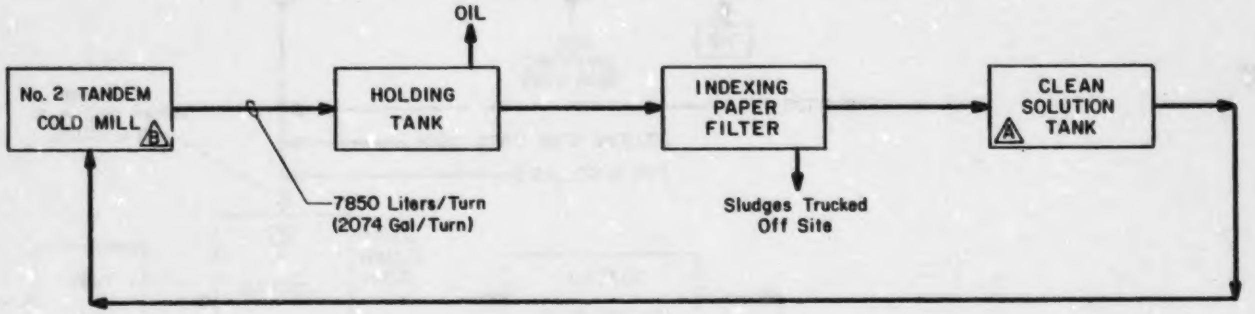
Dwn. 1/12/82

FIGURE VII - 13

PROCESS: Cold Rolling Recirculation

PLANT: 308

PRODUCTION: 747 Metric Tons/Turn
(823 Tons/Turn)


No. 2 TANDEM COLD MILL
B
HOLDING TANK
OIL
INDEXING PAPER FILTER
Sludges Trucked Off Site
CLEAN SOLUTION TANK
A
7850 Liters/Turn
(2074 Gal/Turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

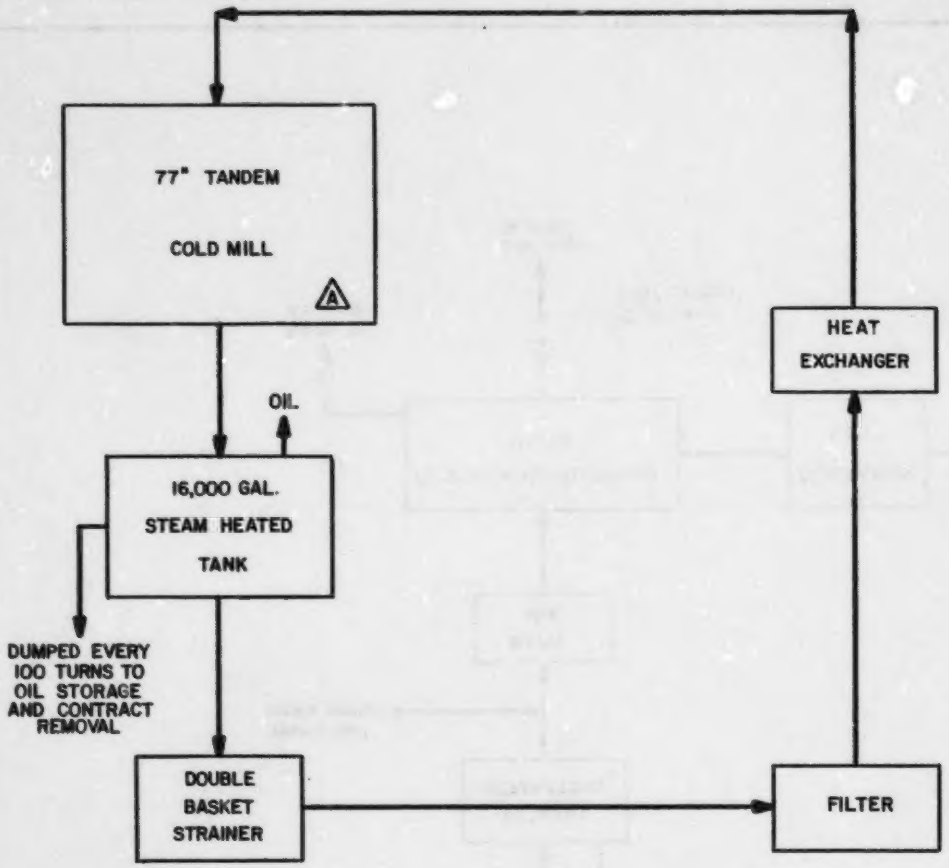
Dwn. 1/12/82

FIGURE VII-14

PROCESS: COLD ROLLING RECIRCULATION

PLANT: 310

PRODUCTION: 799 metric tons/turn
(881 tons/turn)


77" TANDEM COLD MILL
A
OIL
16,000 GAL. STEAM HEATED TANK
DUMPED EVERY 100 TURNS TO OIL STORAGE AND CONTRACT REMOVAL
DOUBLE BASKET STRAINER
FILTER
HEAT EXCHANGER

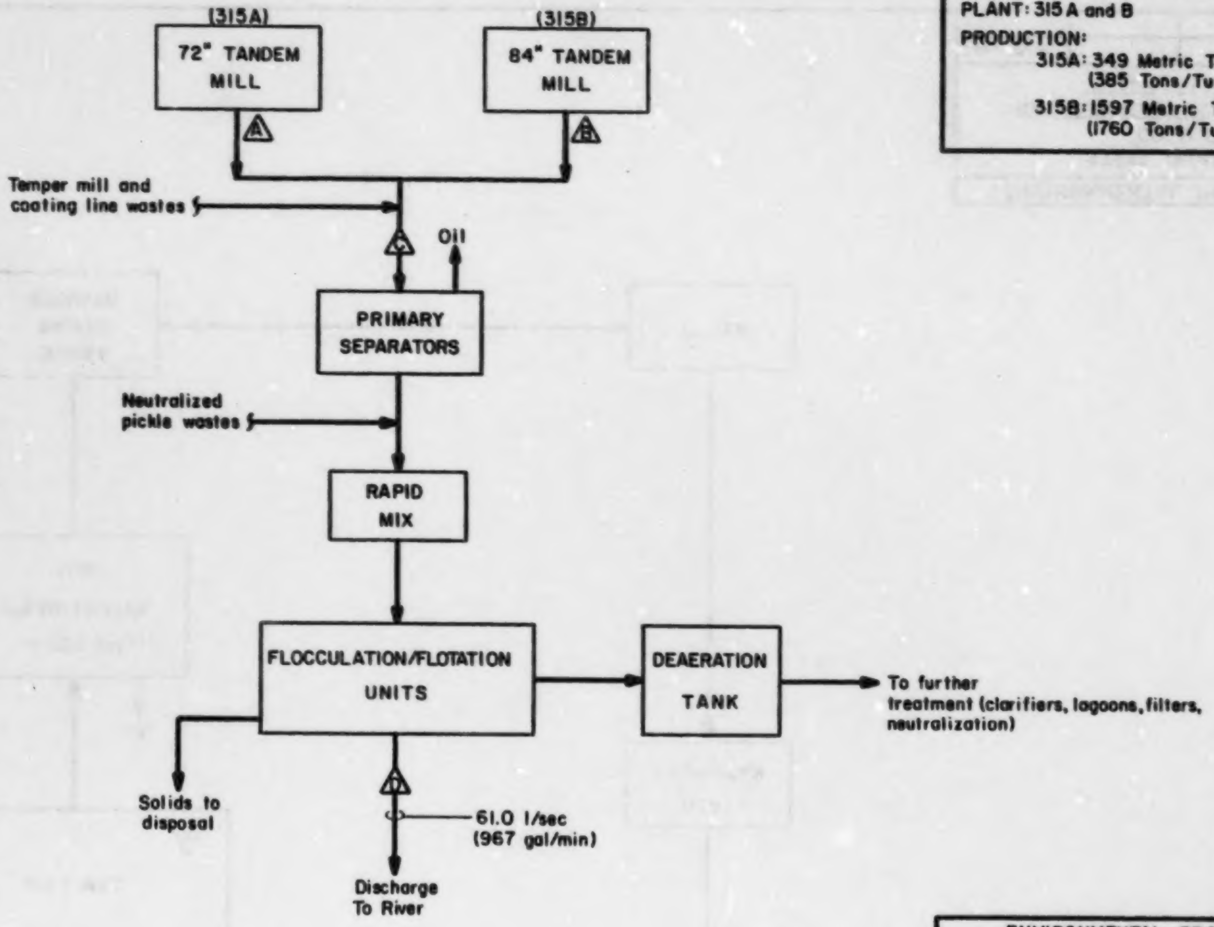
ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn 1/12/82

FIGURE VII-15

PROCESS: Cold Rolling - Recirculation
PLANT: 315 A and B
PRODUCTION:
315A: 349 Metric Tons/Turn (385 Tons/Turn)
315B: 1597 Metric Tons/Turn (1760 Tons/Turn)


(315A)
72" TANDEM MILL
(315B)
84" TANDEM MILL
A
B
Temper mill and coating line wastes
C
Oil
PRIMARY SEPARATORS
Neutralized pickle wastes
RAPID MIX
FLOCCULATION/FLOTATION UNITS
DEAERATION TANK
To further treatment (clarifiers, lagoons, filters, neutralization)
Solids to disposal
D
61.0 l/sec (967 gal/min)
Discharge To River

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

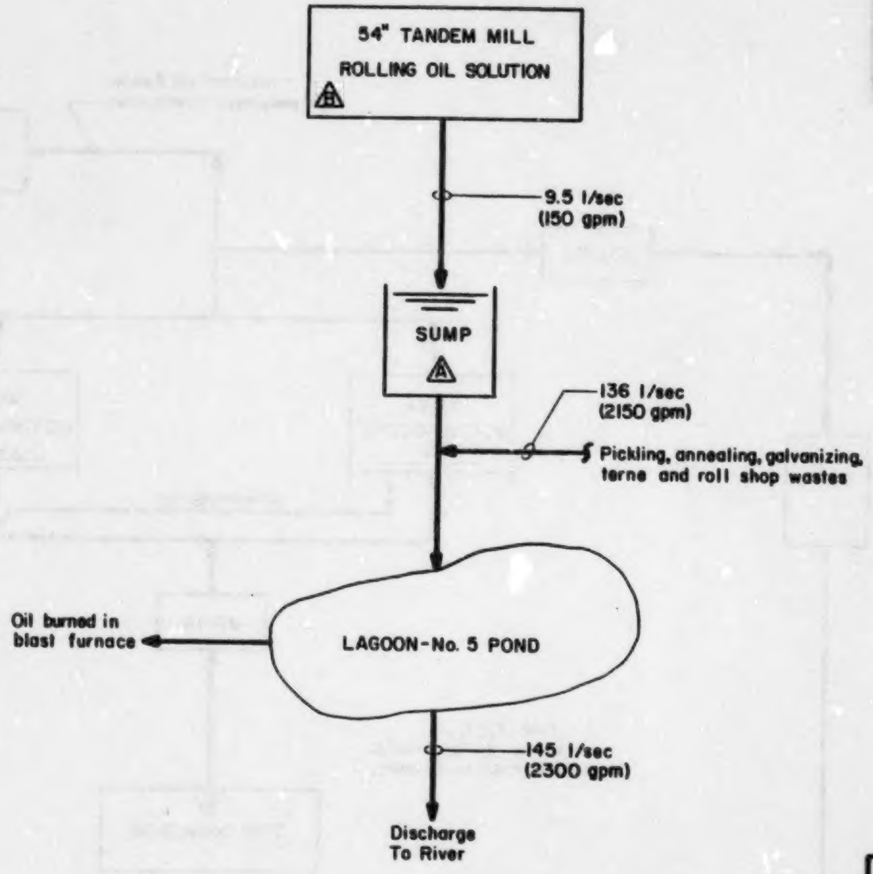
Dwn. 1/14/82

FIGURE VII-16

PROCESS: Cold Rolling - Recirculation

PLANT: 316

PRODUCTION: 454 Metric Tons/Turn
(501 Tons/Turn)

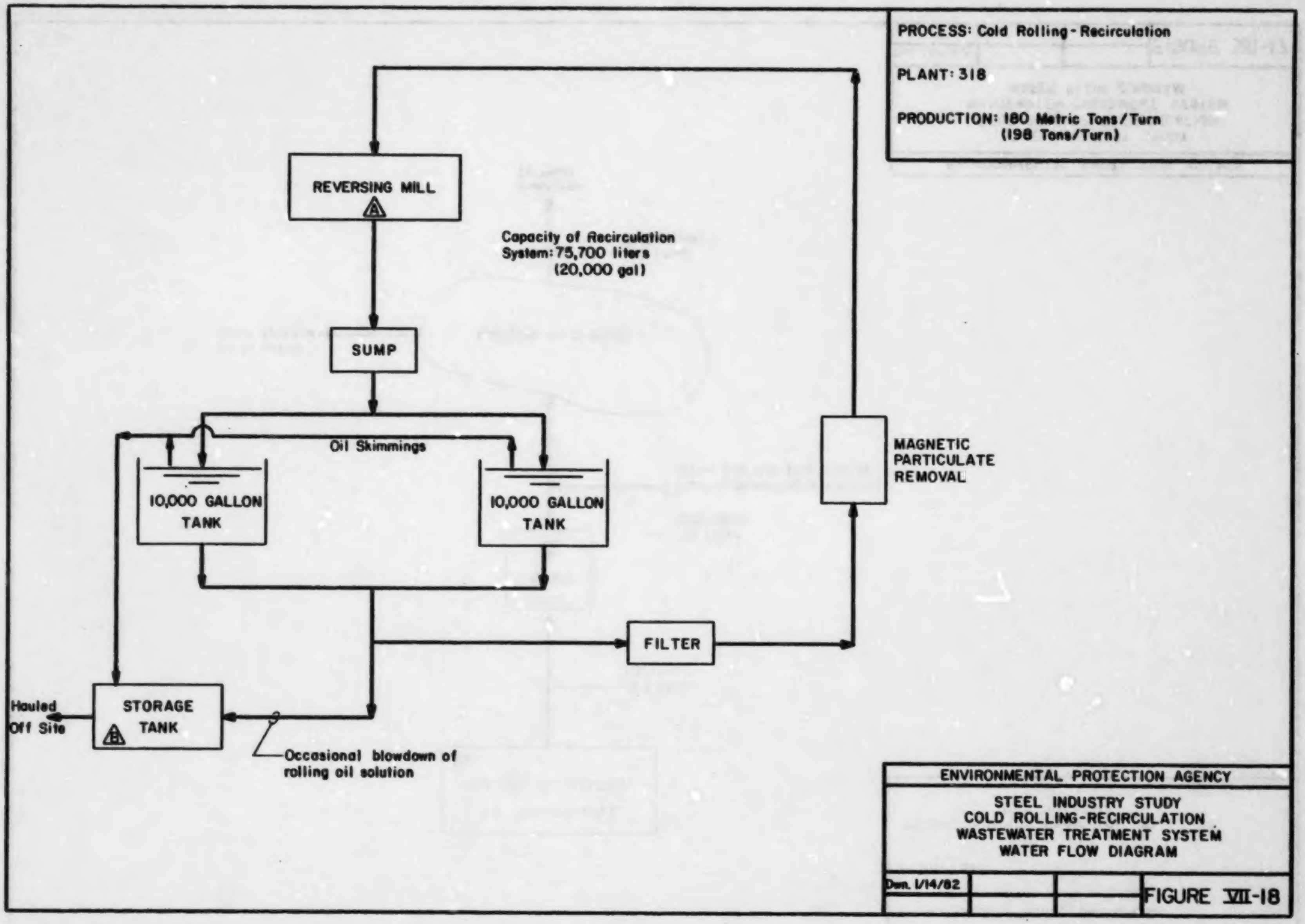

54" TANDEM MILL
ROLLING OIL SOLUTION
9.5 l/sec
(150 gpm)
SUMP
136 l/sec
(2150 gpm)
Pickling, annealing, galvanizing, terne and roll shop wastes
LAGOON-No. 5 POND
Oil burned in blast furnace
145 l/sec
(2300 gpm)
Discharge To River

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 1/14/82

FIGURE VII-17


REVERSING MILL
SUMP
Oil Skimmings
10,000 GALLON TANK
10,000 GALLON TANK
FILTER
MAGNETIC PARTICULATE REMOVAL
STORAGE TANK
Hauled Off Site
Occasional blowdown of rolling oil solution
Capacity of Recirculation System: 75,700 liters (20,000 gal)

PROCESS: Cold Rolling - Recirculation

PLANT: 318

PRODUCTION: 180 Metric Tons/Turn
(198 Tons/Turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 1/14/82

FIGURE VII-18

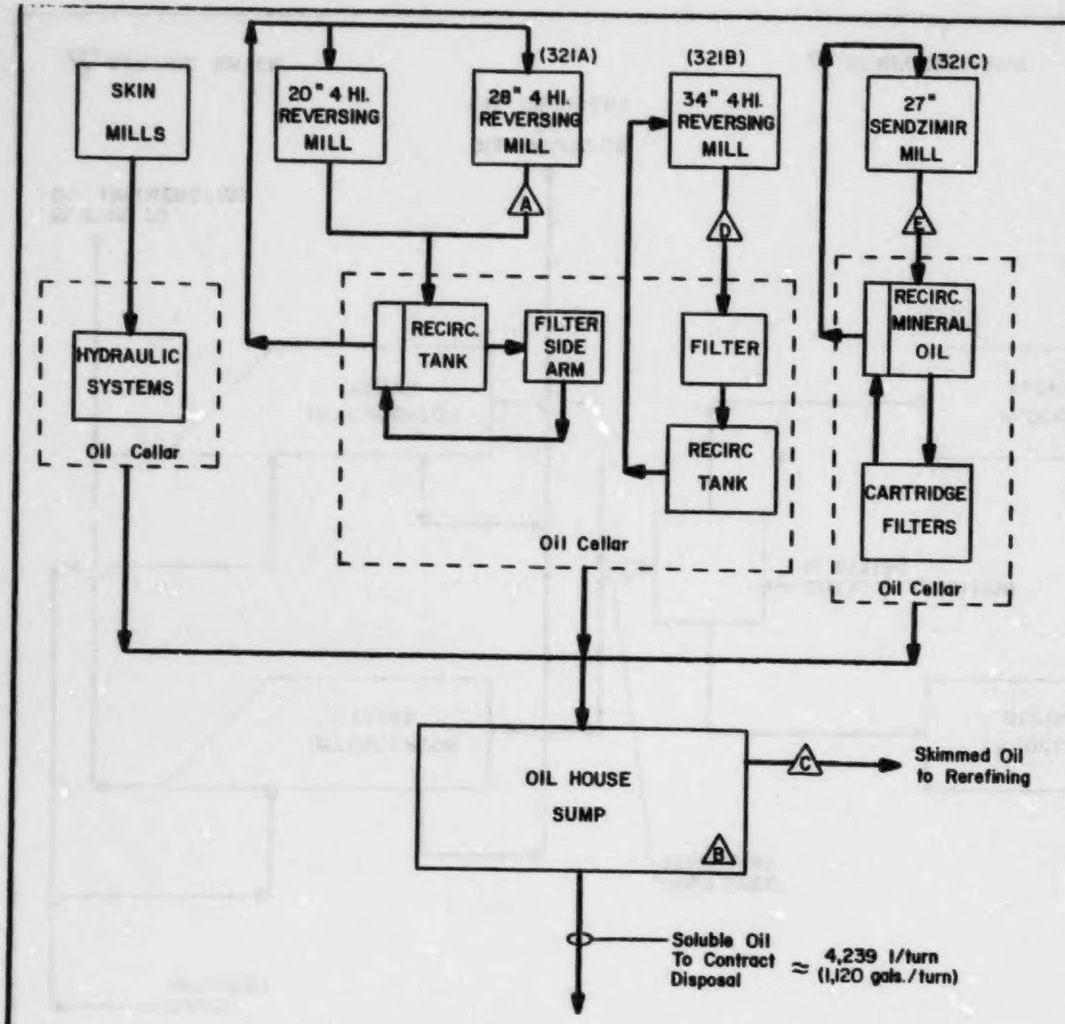
]

PROCESS: Cold Rolling - Recirculation

PLANT: 321A, B & C

PRODUCTION:		
	321A	16.8 Metric Tons / Turn (18.5 Tons/Turn)
	321B	37 Metric Tons / Turn (41 Tons / Turn)
	321C	28 Metric Tons/Turn (31 Tons/Turn)

#1 ENDURO MILL COMPLEX

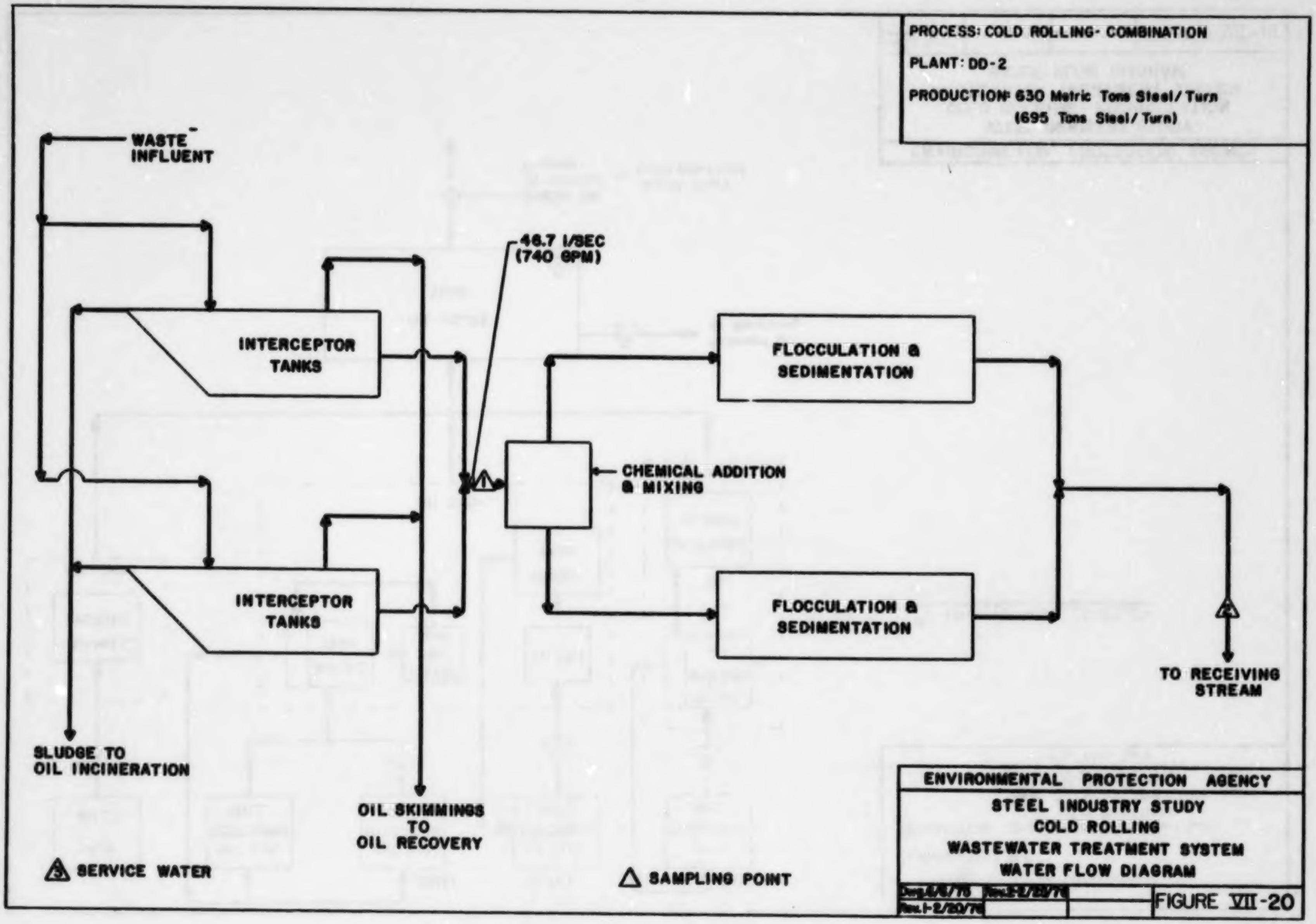

SKIN MILLS
HYDRAULIC SYSTEMS
Oil Cellar
(321A)
20" 4 HI. REVERSING MILL
28" 4 HI. REVERSING MILL
A
RECIRC. TANK
FILTER SIDE ARM
Oil Cellar
(321B)
34" 4 HI. REVERSING MILL
D
FILTER
RECIRC TANK
(321C)
27" SENDZIMIR MILL
E
RECIRC. MINERAL OIL
CARTRIDGE FILTERS
Oil Cellar
OIL HOUSE SUMP
B
C
Skimmed Oil to Rerefining
Soluble Oil To Contract Disposal
≈ 4,239 l/turn (1,120 gals./turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING - RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 1/15/82

FIGURE VII-19


PROCESS: COLD ROLLING- COMBINATION
PLANT: DD-2
PRODUCTION: 630 Metric Tons Steel/Turn
(695 Tons Steel/Turn)
WASTE INFLUENT
INTERCEPTOR TANKS
INTERCEPTOR TANKS
46.7 l/SEC
(740 GPM)
1
CHEMICAL ADDITION & MIXING
FLOCCULATION & SEDIMENTATION
FLOCCULATION & SEDIMENTATION
2
TO RECEIVING STREAM
SLUDGE TO OIL INCINERATION
OIL SKIMMINGS TO OIL RECOVERY
3 SERVICE WATER
SAMPLING POINT
Dwg.6/6/76
Rev.2-2/20/76
Rev.1-2/20/76

ENVIRONMENTAL PROTECTION AGENCY

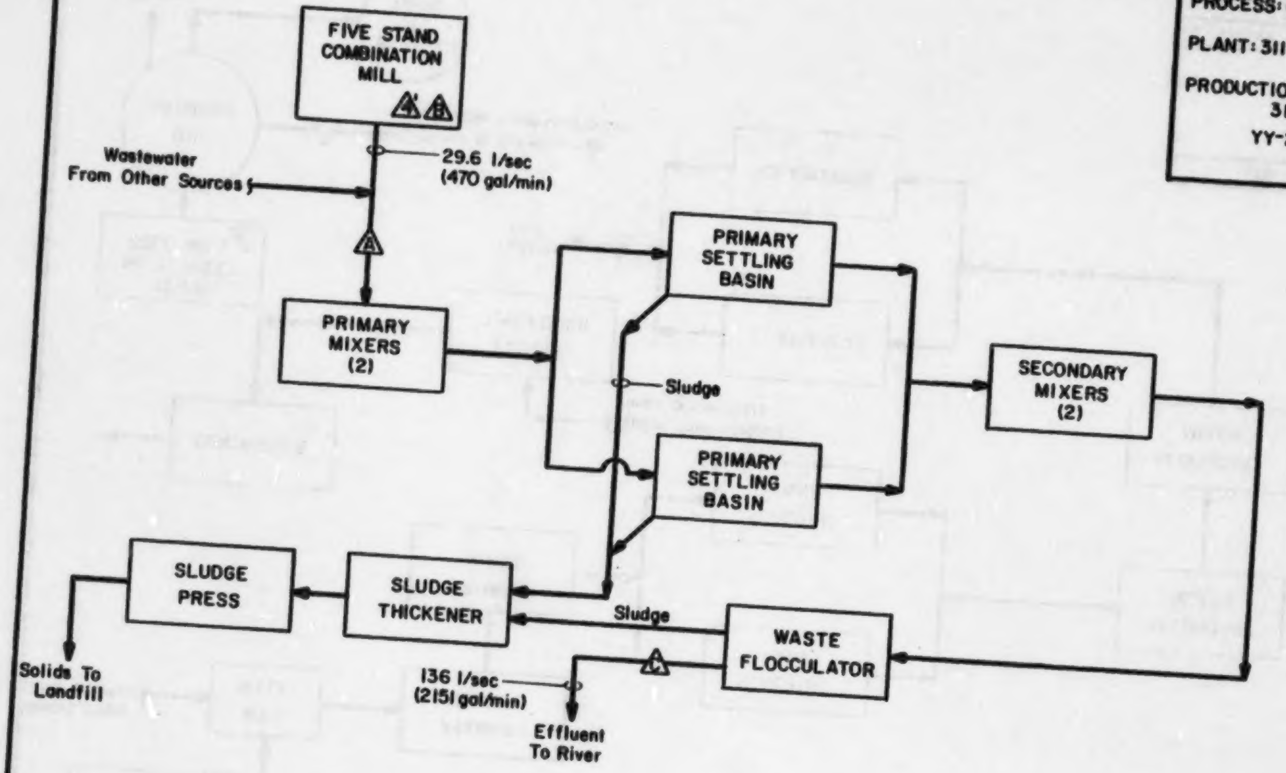
STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-20

PROCESS: Cold Rolling-Combination

PLANT: 311 and YY-2

PRODUCTION: 311: 1310 Metric Tons/Turn
(1444 Tons/Turn)
YY-2: 1202 Metric Tons/Turn'
(1325 Tons/Turn)'


FIVE STAND COMBINATION MILL
A
B
29.6 l/sec (470 gal/min)
Wastewater From Other Sources
A
PRIMARY MIXERS (2)
PRIMARY SETTLING BASIN
Sludge
PRIMARY SETTLING BASIN
SECONDARY MIXERS (2)
SLUDGE PRESS
SLUDGE THICKENER
Sludge
WASTE FLOCCULATOR
C
136 l/sec (2151 gal/min)
Solids To Landfill
Effluent To River

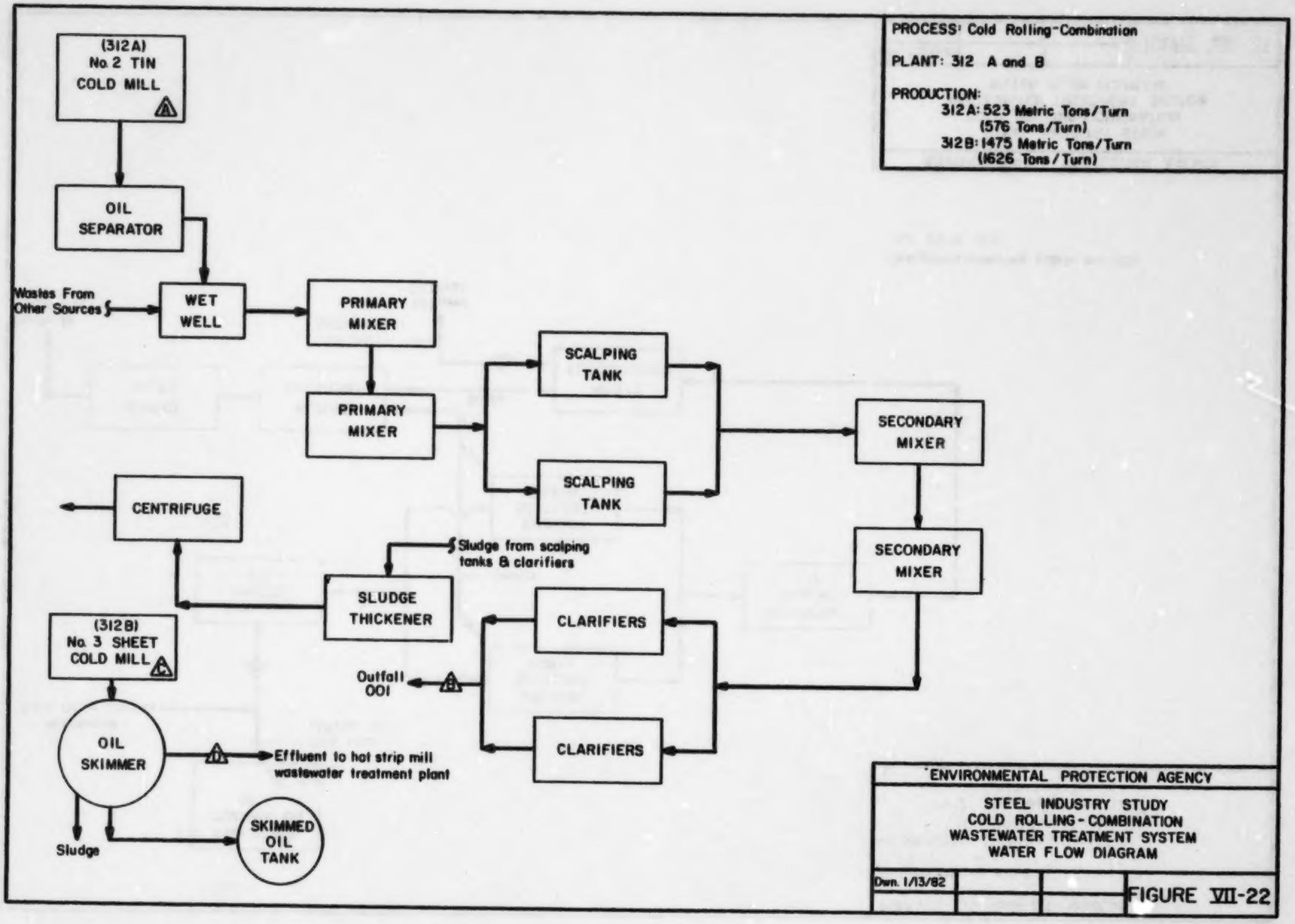
Designates sampling points and data for YY-2 visit.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-COMBINATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 1/13/82

FIGURE VII-21


(312A)
No. 2 TIN
COLD MILL
1
OIL SEPARATOR
Wastes From Other Sources
WET WELL
PRIMARY MIXER
PRIMARY MIXER
SCALPING TANK
SCALPING TANK
SECONDARY MIXER
SECONDARY MIXER
CENTRIFUGE
Sludge from scalping tanks & clarifiers
SLUDGE THICKENER
CLARIFIERS
CLARIFIERS
(312B)
No. 3 SHEET
COLD MILL
C
Outfall 001
B
OIL SKIMMER
D
Effluent to hot strip mill wastewater treatment plant
Sludge
SKIMMED OIL TANK

PROCESS: Cold Rolling-Combination

PLANT: 312 A and B

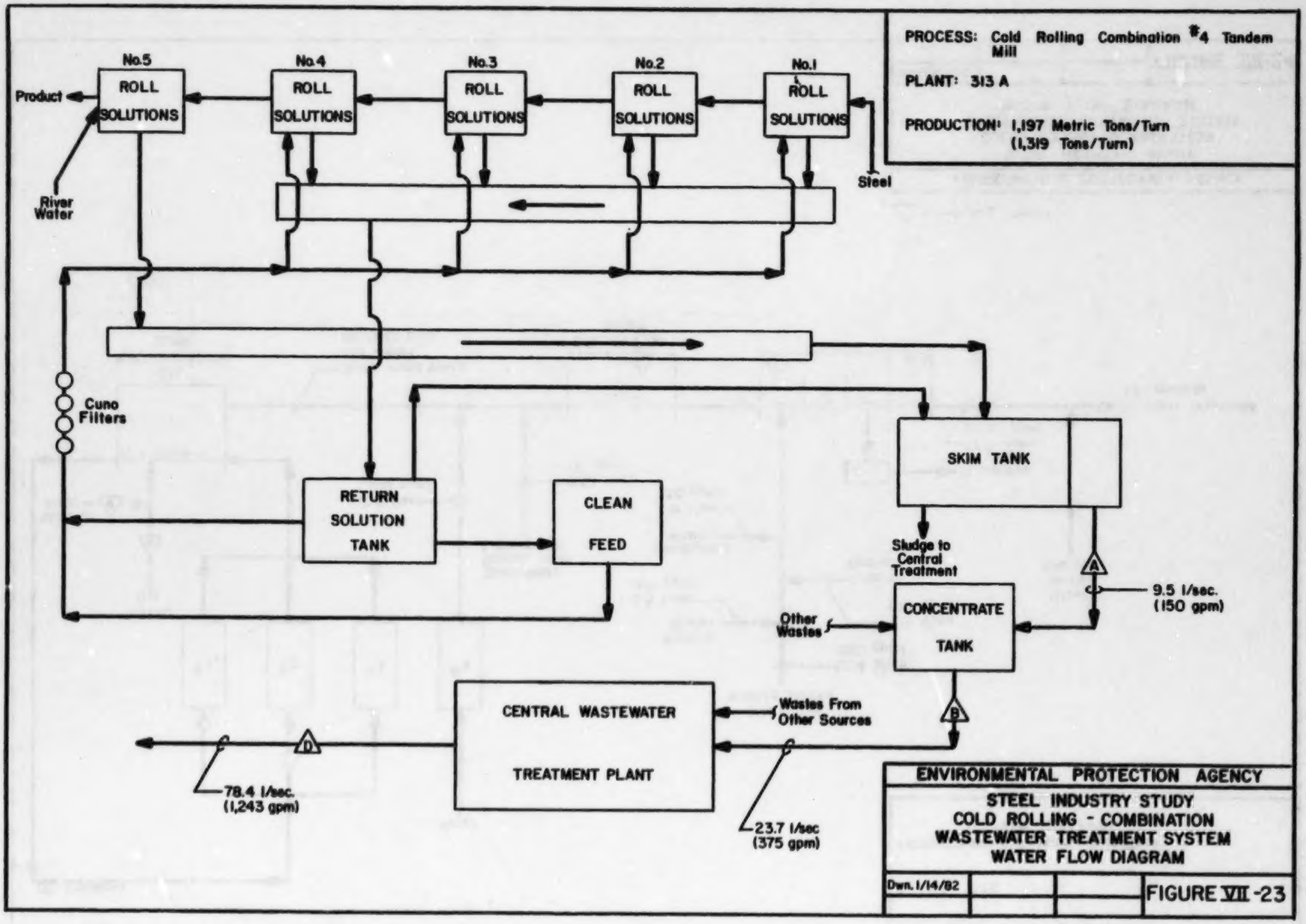
PRODUCTION:
312A: 523 Metric Tons/Turn
(576 Tons/Turn)
312B: 1475 Metric Tons/Turn
(1626 Tons/Turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING - COMBINATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 1/13/82

FIGURE VII-22


No.1
ROLL SOLUTIONS
No.2
ROLL SOLUTIONS
No.3
ROLL SOLUTIONS
No.4
ROLL SOLUTIONS
No.5
ROLL SOLUTIONS
Steel
Product
River Water
Cuno Filters
RETURN SOLUTION TANK
CLEAN FEED
SKIM TANK
Sludge to Central Treatment
CONCENTRATE TANK
Other Wastes
A
9.5 l/sec. (150 gpm)
B
Wastes From Other Sources
23.7 l/sec (375 gpm)
CENTRAL WASTEWATER TREATMENT PLANT
D
78.4 l/sec. (1,243 gpm)

PROCESS: Cold Rolling Combination #4 Tandem Mill

PLANT: 313 A

PRODUCTION: 1,197 Metric Tons/Turn
(1,319 Tons/Turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING - COMBINATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

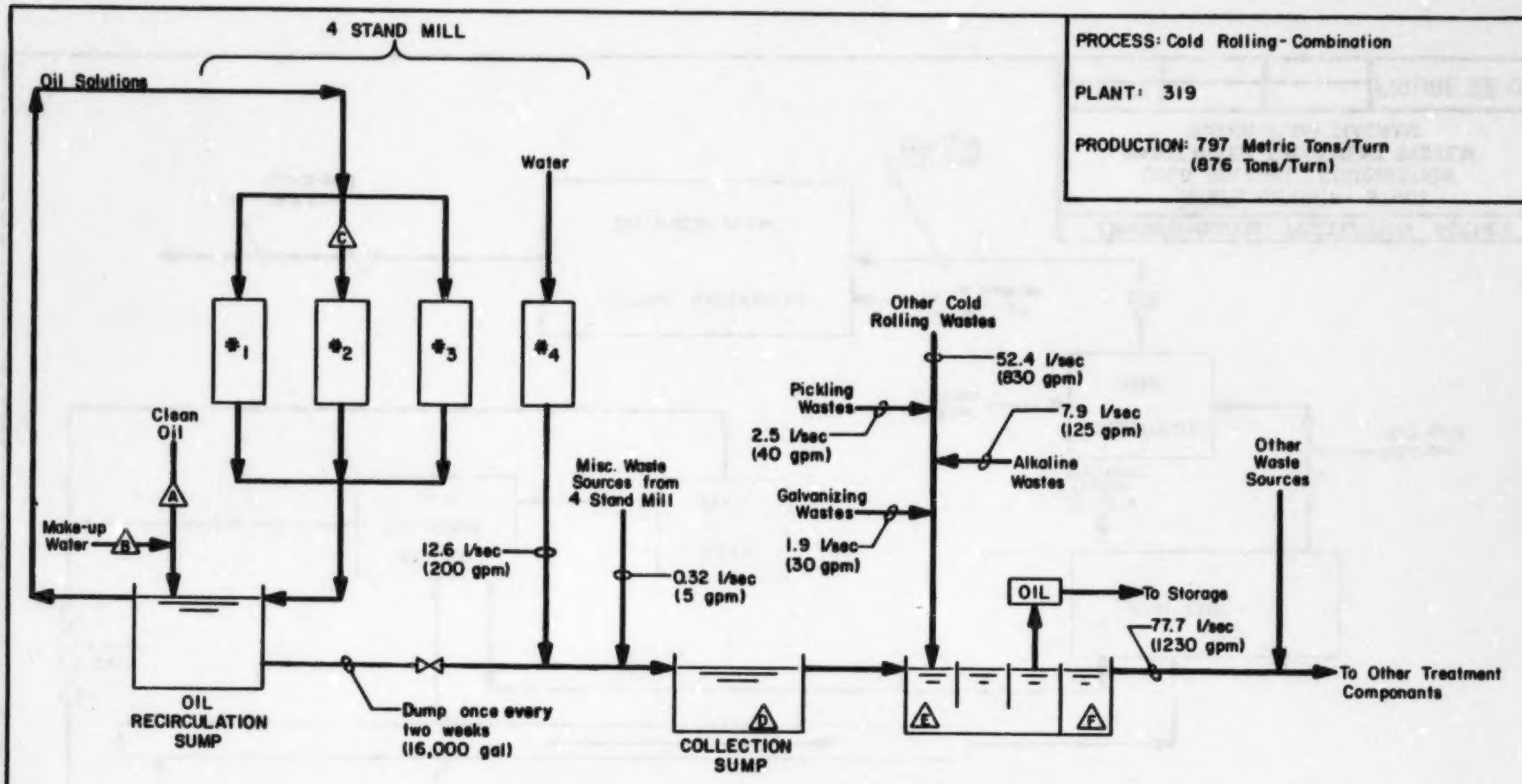
Dwn. 1/14/82

FIGURE VII -23

PROCESS: Cold Rolling-Combination

PLANT: 319

PRODUCTION: 797 Metric Tons/Turn
(876 Tons/Turn)


4 STAND MILL
Oil Solutions
Water
#1
#2
#3
#4
C
Clean Oil
A
Make-up Water
B
12.6 l/sec (200 gpm)
Misc. Waste Sources from 4 Stand Mill
0.32 l/sec (5 gpm)
OIL RECIRCULATION SUMP
Dump once every two weeks (16,000 gal)
COLLECTION SUMP
D
Other Cold Rolling Wastes
52.4 l/sec (830 gpm)
Pickling Wastes
2.5 l/sec (40 gpm)
7.9 l/sec (125 gpm)
Alkaline Wastes
Galvanizing Wastes
1.9 l/sec (30 gpm)
OIL
To Storage
77.7 l/sec (1230 gpm)
E
F
Other Waste Sources
To Other Treatment Componants

△ SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-COMBINATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

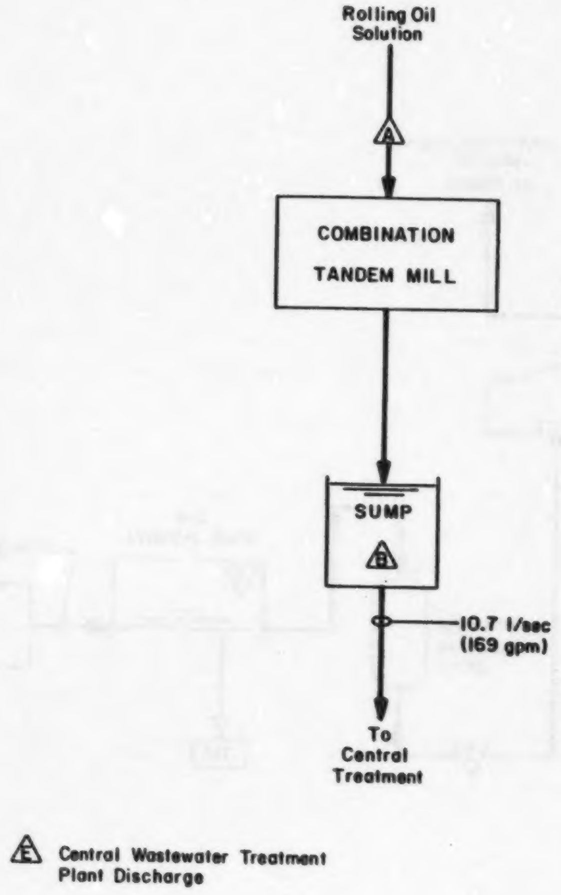
Dwn.6/30/80

FIGURE VII-24

PROCESS: Cold Rolling - Combination

PLANT: 320 A

PRODUCTION: 725 metric tons/turn
(800 tons/turn)


Rolling Oil Solution
A
COMBINATION TANDEM MILL
SUMP
B
10.7 l/sec (169 gpm)
To Central Treatment
E Central Wastewater Treatment Plant Discharge

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING - COMBINATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

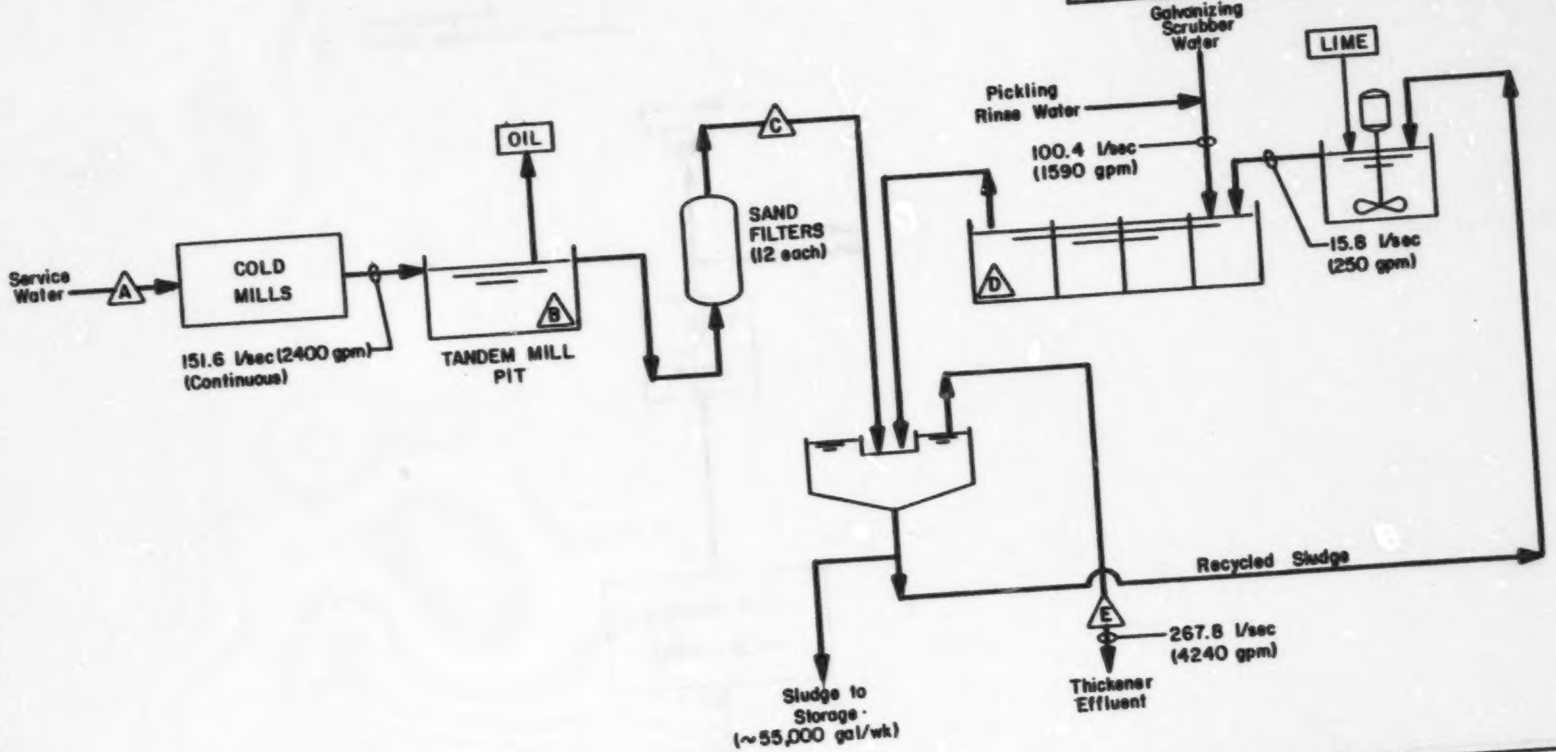
Dwn. 4/12/82

FIGURE VII-25

PROCESS: Cold Rolling-Direct Application

PLANT: 106

PRODUCTION: 1564 metric tons/turn
(1718 tons/turn)


Service Water
A
COLD MILLS
151.6 l/sec (2400 gpm)
(Continuous)
OIL
B
TANDEM MILL PIT
SAND FILTERS
(12 each)
C
Pickling Rinse Water
Galvanizing Scrubber Water
100.4 l/sec
(1590 gpm)
D
LIME
15.8 l/sec
(250 gpm)
Recycled Sludge
E
267.8 l/sec
(4240 gpm)
Thickener Effluent
Sludge to Storage
(~55,000 gal/wk)

△ SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-DIRECT APPLICATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

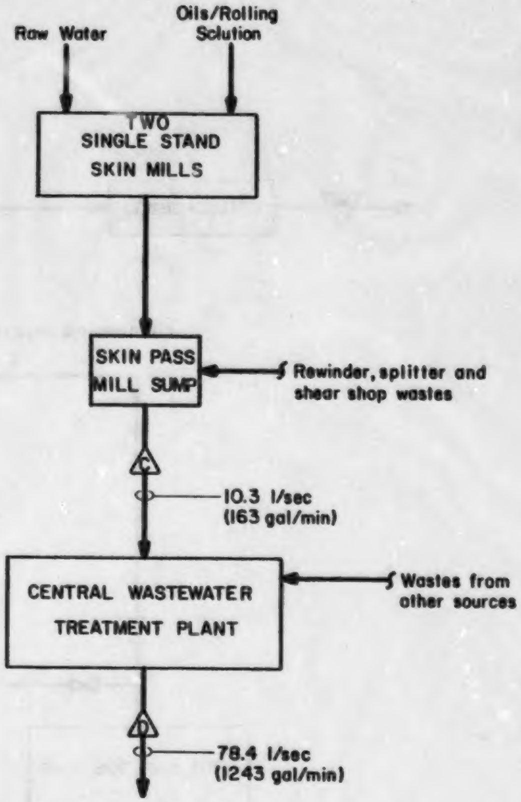
Dwn.6/27/80

FIGURE VII-26

PROCESS: Cold Rolling, Direct Application, Skin Mills

PLANT: 313 B

PRODUCTION: 966 Metric Tons/Turn
(1065 Tons/Turn)


Raw Water
Oils/Rolling Solution
TWO SINGLE STAND SKIN MILLS
SKIN PASS MILL SUMP
Rewinder, splitter and shear shop wastes
C
10.3 l/sec (163 gal/min)
CENTRAL WASTEWATER TREATMENT PLANT
Wastes from other sources
D
78.4 l/sec (1243 gal/min)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-DIRECT APPLICATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

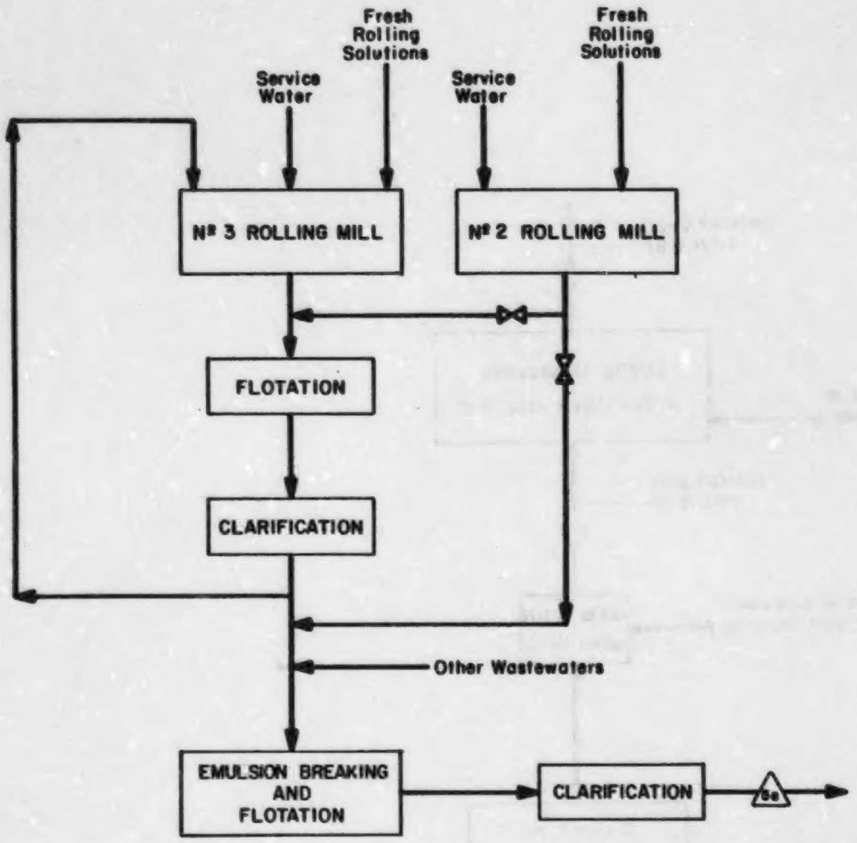
Dwn. 1/14/82

FIGURE VII-27

PROCESS: Cold Rolling-Direct Application

PLANT: 920G

PRODUCTION: 710 metric tons/turn
(783 tons/turn)


Service Water
Fresh Rolling Solutions
Service Water
Fresh Rolling Solutions
Nº 3 ROLLING MILL
Nº 2 ROLLING MILL
FLOTATION
CLARIFICATION
Other Wastewaters
EMULSION BREAKING AND FLOTATION
CLARIFICATION
5a

△ – Sampling Location

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-DIRECT APPLICATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 5/4/82

FIGURE VII-28

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION VIII

COST, ENERGY, AND NON-WATER QUALITY IMPACTS

Introduction

This section presents the incremental costs incurred in the application of the different levels of pollution control technology to the cold rolling subdivision based upon the application of model treatment systems. Also included are energy requirements, the non-water quality impacts, and descriptions of treatment technologies associated with the application of the BPT, BAT, NSPS, PSES, and PSNS levels of treatment. In addition, solid waste generation rates and the consumptive use of water are discussed.

Actual Costs Incurred by the Plants Sampled or Solicited for this Study

The effluent treatment costs supplied by the industry for the cold rolling subdivision during sampling visits and in response to the D-DCPs are presented in Tables VIII-1 through VIII-3 for recirculation, combination and direct application mills, respectively. These costs have been updated to July 1, 1978 dollars. Many of the industry responses included total costs for central treatment systems. Where possible, these costs were analyzed and allocated to cold rolling wastewaters.

Because of the extensive use of central treatment for cold rolling wastewaters, the Agency could not directly verify its model-based cost estimates for separate treatment of cold rolling wastes with cost data reported by the industry for central treatment systems. However, the Agency did compare its model-based treatment costs with industry costs for several central treatment systems by summing the model-based treatment costs for each subcategory included in the existing central treatment systems. The results of this comparison, which are presented in Volume I, demonstrate that the Agency's costing methodology accurately reflects industry costs for central treatment facilities in general, and for those systems including cold rolling wastewaters in particular. In fact, as shown by the data presented in Volume I, the Agency's cost estimates for separate treatment for finishing operation wastewaters are likely to be higher than industry costs for central treatment.

Control and Treatment Technologies (C&TT)

A review of the treatment components included in the BPT and BAT alternative treatment systems is presented in Table VIII-4. The following items are described for each treatment method in the C&TT table.

1. Description of treatment components
2. Implementation time
3. Land requirements

Cost, Energy, and Non-water Quality Impacts

General Discussion

This section addresses the additional costs that will be required to install and operate the BPT, BAT, NSPS, PSES and PSNS alternative treatment systems. The alternative treatment systems for each level of treatment are illustrated in Figure VIII-1. In addition, air pollution, water consumption, energy requirements, and solid waste disposal impacts associated with each level of treatment are discussed. Costs, solid waste generation and energy requirements were estimated from alternative treatment systems developed in Sections IX through XIII of this report and are presented in the tables and text of this section.

Estimated Costs for the Installation of Pollution Control Technologies

A. Costs Required to Achieve the BPT Limitations

On the basis of water pollution control facilities in-place as of July 1, 1981, the Agency estimates that the industry will need to spend $5.1 million (capital cost) to bring the discharge from cold rolling operations into compliance with the BPT limitations. The total estimated capital cost for compliance with the BPT limitations is $27.7 million. In addition, the Agency estimates the incremental annual cost to be $0.84 million, while the total annual costs are $3.6 million. This total annual cost estimate takes into account a $0.52 million credit for the recovery and sale of the waste oil solutions.

To estimate the above costs, the Agency developed model plants , based upon average plant sizes, at the model flow rates (see Section IX for development of these flow rates). Plant-by-plant capital and annual cost estimates were then made by factoring the model plant costs by the ratio of the actual production at each plant to the model plant size using the "six-tenth" rule. This method yields cost estimates for the subcategory which are representative of the actual costs to the industry. Cost comparisons presented in Volume I verified the accuracy of this costing methodology. The in-place and required costs are based upon information available to the Agency, including DCP responses. A summary of the in-place and required costs is provided in Table VIII-5 for the recirculation, combination and direct application segments. In addition, Tables VIII-6 through VIII-10 present the model costs upon which these in-place and required costs were based.

The cost estimates were based upon the assumption that separate wastewater treatment systems for cold rolling wastewaters would be installed at all plants. However, as pointed out earlier, wastewaters from most cold rolling operations are treated in central treatment systems. Treatment in central systems costs less because of economies of scale and because duplicate equipment components are not installed. Hence, the Agency expects that the actual cost of compliance for cold rolling operations will be less than shown above.

B. Costs Required to Install BAT Treatment Systems

The Agency considered three BAT alternative treatment systems for cold rolling operations. These alternatives are outlined in Section X. The model costs involved in applying each of the BAT alternative treatment systems to the BPT model treatment system are presented in Tables VIII-11 through VIII-15. The estimated investment and annual costs for each BAT alternative follow. These subdivision-wide costs were determined in the same manner as the BPT costs, i.e., unit model costs were scaled to actual plant sizes. Table VIII-16 provides a breakdown of the costs by cold rolling segment.

	Costs - Millions of 1978 Dollars			
	Capital		Annual	
Alternative	In-Place	Required	In-Place	Required
BAT-1	2.9	10.1	0.2	1.8
BAT-2	2.9	111.1	1.1	15.4
BAT-3	0.0	268.3	0.0	53.5

C. BCT Cost Comparison

The BCT limitations for each segment of the cold rolling subdivision are the same as the corresponding BPT limitations. Hence, no additional costs beyond BPT are associated with achieving the BCT limitations.

D. Costs Required to Achieve NSPS

The Agency developed four NSPS alternative treatment systems for cold rolling operations. The NSPS treatment systems are the same as the BPT and BAT treatment systems. The NSPS model flow rates are lower than the model flows for BPT and BAT, except for single stand recirculation mills, for which the NSPS flows are the same as the BPT and BAT flows. The model costs are presented in Tables VIII-17 through VIII-20. Only model treatment costs are presented here, since projections of capacity additions were not made as part of this study. The model costs for single stand recirculating mills are identical to the BPT and BAT costs presented above.

E. Costs Required to Achieve the Pretreatment Standards

Pretreatment standards apply to those new and existing plants that discharge to POTW systems. The Agency developed four alternative pretreatment systems for new and existing cold rolling operations. The model costs for the pretreatment alternatives for existing sources (PSES) are identical to the BPT and BAT costs as presented in Tables VIII-6 through VIII-15. Model costs for the pretreatment alternatives for new sources (PSNS) are identical to NSPS costs and are presented in Tables VIII-17 through VIII-20. Table VIII-21 provides a breakdown of these PSES costs by cold rolling segment.

The subdivision-wide costs for each PSES alternative system are as follows:

Alternative	Capital Costs		Annual Costs	
	In-Place	Required	In-Place	Required
PSES 1	4.3	57.8	0.6	7.3
PSES 2	4.3	143.8	0.6	19.4
PSES 3	4.3	2041.3	0.6	264.0
PSES 4	4.3	3948.0	0.6	576.4

Energy Impacts

Moderate amounts of energy are required for the BPT, and BAT and PSES alternative treatment systems. The alternative treatment systems using activated carbon require more than twice the amount of energy used at BPT; the alternative using vapor compression distillation requires more than forty times the energy use at BPT. The energy requirements for the various levels of treatment are presented below:

A. Energy Impacts at BPT

The estimated energy requirement of 34.4 million kilowatt hours per year for BPT is based upon the installation of the model treatment system for all cold rolling operations with flows similar to that of the treatment model. This estimate represents 0.060% of the 57 billion kilowatt hours of electricity used by the steel industry in 1978. The estimated energy use for each segment of the cold rolling subdivision is presented in Table VIII-22 for BPT, BAT and PSES. These energy requirements are justified when compared to the pollution control benefits associated with compliance with the BPT limitations.

B. Energy Impacts at BAT

The additional energy needs for the three BAT alternative treatment systems, along with the percentage of total energy consumption for each BAT alternative, are summarized below.

BAT Alternative	kwh per year	% of Industry Usage
1	7.05 million	0.012
2	47.22 million	0.083
3	807.82 million	1.42

C. Energy Impacts at NSPS and PSNS

The Agency did not estimate the total impacts for NSPS and PSNS, since an estimate of the number of new source cold rolling operations was not made as part of this study. The annual energy requirements associated with the model NSPS and PSNS alternatives are as follows:

Annual Energy Requirements
Thousands of kwh per year

NSPS & PSNS Alternative	Recirculation		Combination	Direct Application	
	Single	Multi		Single	Multi
1	120	128	936	216	996
2	128	136	1,124	228	1,212
3	160	228	1,436	352	1,584
4	432	688	19,620	1,400	22,796

D. Energy Impacts at PSES

The energy usage associated with the PSES alternative treatment systems are presented below, along with the percentage of total electrical energy used by the industry in 1978. The energy usage for PSES Alternatives 2, 3, and 4 are incremental to the requirements for PSES 1.

PSES Alternative	Million kwh/yr	% of Industry Usage
1	1.02	0.002
2	1.10	0.002
3	1.67	0.003
4	7.66	0.013

Non-water Quality Impacts

In this analysis, the Agency investigated the impact of implementing the alternative treatment systems on air pollution, solid waste disposal, and water consumption. A discussion of these impacts is presented below.

A. Air Pollution

The water pollution control technologies evaluated in this study are not significant sources of air pollution.

B. Solid Waste Disposal

Treatment at both the BPT and BAT levels results in the generation of large amounts of solid waste in the form of sludges. These sludges result from the removal of suspended solids and oil and grease. The following table presents a summary of the quantity of solid waste produced using the BPT and BAT alternative treatment systems.

Solid Waste Generation
For Cold Rolling Operations

Treatment Level	Dewatered Solids (tons/year)	Oil and Grease (gal/year)
BPT	129,280	6,073,830
BAT 1 thru 3	negligible	negligible
PSES 1	2,320	428,130
PSES 2 thru 4	negligible	negligible

As shown above, the largest quantity of solid wastes is generated at the BPT level, while the BAT treatment systems generate negligible additonal amounts. In addition, solid waste is generated at the NSPS and PSNS levels, as noted below for the model plants. The wastes generated at NSPS and PSNS Alternatives 2, 3, and 4 are negligible.

Solid Waste Generation For Cold Rolling Operations

Subdivision	Dewatered Solids (tons/yr)	Oil and Grease (gal/yr)
Recirculation		
Single Stand	40	5,710
Multi Stand	180	55,700
Combination	4180	71,400
Direct Application		
Single Stand	340	5,710
Multi Stand	1400	92,900

The NSPS and Pretreatment models are similar to BPT/BAT treatment systems. Table VIII-23 lists the quantities of dewatered solids and oil and grease for each of the cold rolling segments.

Some of the solid wastes result from the use of lime in the treatment systems. Lime is used to raise pH levels after the emulsion breaking step and can produce up to 8-10 tons of sludge per day in the form of untreated calcium hydroxide, along with precipitated calcium carbonates. If acid pickling wastewaters are used to break the emulsions, the sludges will also contain metal hydroxides (and calcium sulfate where sulfuric acid is used). Disposal of these sludges adds to the treatment costs. Proper disposal of these sludges will prevent runoff and leachate from entering streams.

Additional solids may be generated depending upon the BAT alternative. If the filter system proposed in Alternative 1 is installed, additional solid wastes will be produced when the filters are backwashed. The volume of sludge generated at BAT is small compared to the amount generated at the BPT level.

A large portion of the waste oil produced at cold rolling operations is used, along with purchased fuel, to fire boilers, or sold to outside contractors for reclamation and reuse. Some contractors have their processing facilities located at the steel plant site and operate them in conjunction with the wastewater treatment facilities. As a result of these practices, only a small portion of the waste oils produced are actually disposed of.

The Agency believes that the effluent reduction benefits associated with compliance with the limitations and standards justify the adverse environmental impacts associated with solid waste disposal.

C. Water Consumption

No significant water consumption is expected to occur at cold rolling operations as a result of the installation of the alternative treatment systems. Recycle systems are installed at recirculation mills, but these are usually closed systems with no inherent water consumption. There are no other opportunities for significant water consumption in cold rolling operations.

Summary of Impacts

The Agency concludes that the pollution control benefits described below for the cold rolling subdivision outweigh the adverse environmental impacts associated with energy consumption, air pollution, solid waste disposal, and water consumption.

	Direct Discharges	
	Effluent Loadings (Tons/Year)	
	Raw Waste	BPT/BCT
Flow, MGD	29.6	28.1
Suspended Solids	22,502	653
Oil and Grease	86,492	286
Toxic Metals	94	21
Toxic Organics	337	4.1

	Indirect Discharges	
	Effluent Loadings (Tons/Year)	
	Raw Waste	PSES -1
Flow, MGD	0.2	0.2
Suspended Solids	275	4.4
Oil and Grease	3,986	1.9
Toxic Metals	5.4	0.3
Toxic Organics	2.1	0.2

The Agency also concludes that the effluent reduction benefits associated with compliance with new source standards (NSPS, PSNS) outweigh the adverse energy and non-water quality environmental impacts.

TABLE VIII-1

EFFLUENT TREATMENT COSTS
COLD ROLLING - RECIRCULATION

(All costs are expressed in July, 1978 Dollars.)

Plant Code Reference Code	BB-2* 060-03	EE-2* 1120-01	X-2(1) 060B-03	XX-2* 684I-01	101 020B&020C	102* 384A(02&03)	- 684F-03(2)
Initial Investment Cost	1,361,231	436,693	2,469,600	430,091	712,200	1,782,070	863,564
Annual Cost							
Capital(1)	122,375	39,259	222,017	38,665	64,027	160,208	-
Cost of Capital	-	-	-	-	-	-	37,100
Depreciation	-	-	-	-	-	-	86,360
Operation and Maintenance	81,096	180,521	194,500	2,489	170,900	49,657	11,000
Energy, Power, Chemicals, etc.	10,569	116,484	-	-	-	-	-
Other	-	-	-	-	-	36,583	56,800
TOTAL	214,040	336,264	416,517	41,154	234,927	246,448	181,360
$/Ton	0.13	0.24	0.65	0.13	0.49	0.26	0.19

---

(1) Capital is based on the formula: Initial Investment X 0.0899.

(2) Reported costs are for a treatment system which treats two cold rolling mills. Costs to treat the individual operation sampled were unable to be broken out.

(3) The costs for this operation were supplied in the response to the D-DCP.

*: Portion of costs attributable to this subcategory.

TABLE VIII-2

EFFLUENT TREATMENT COSTS
COLD ROLLING - COMBINATION

Plant Code Reference Code	DD-2* 584E-01	YY-2* 432D-01
Initial Investment Cost	3,913,654	166,907
Annual Cost		
Capital(1)	351,837	15,005
Operation and Maintenance	250,105	7,898
Energy & Power	191,552	2,538
TOTAL	793,494	25,441
$/Ton	0.52	0.036

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(1) Capital is based on the formula: Initial Investment X 0.0899.

* Portion attributed to this subcategory only.

TABLE VIII-3

EFFLUENT TREATMENT COSTS
COLD ROLLING - DIRECT APPLICATION

Plant Code	105*
Reference No.	584F-04
Initial Investment Cost	2,804,245
Annual Costs	
Cost of Capital	Annual costs not available since company accounting procedures do not segregate production and pollution operating costs.
Depreciation	
Operation and Maintenance	
Energy and Power	
TOTAL	
$/Ton	Unk

---

* Portion attributed to this subcategory only.

TABLE VIII-4

CONTROL AND TREATMENT TECHNOLOGIES
COLD ROLLING

Treatment and/or Control Methods Employed	Implementation Time	Land Requirements
A. Oil separator - used to treat wastewaters from the cold rolling mill to remove any floating oils that may be present.	Included in Step B Implementation time.	Contained within an equalization tank, Step B.
B. Equalization tank - to protect treatment system from shock or high toxic loads.	9 months	50'x50'
C. Alum addition - used in conjunction with Step D to break emulsion and coagulate fine particles.	6 months	No additional space required.
D. Acid addition - used to lower the pH to 4-5, in conjunction with Step C, to break emulsion.	6 months	No additional space required.
E. Lime neutralization - to raise pH to 6-9 in a mixing tank, following Step D.	6 months	25'x25'
F. Polymer addition - add polymer or polyelectrolyte to promote settling.	6 months	No additional space required.
G. Air flotation - effluent from Step F treated with air flotation, for solids and oil separation.	12 months	25'x25' (for all rolling operations).

TABLE VIII-4
CONTROL AND TREATMENT TECHNOLOGIES
COLD ROLLING
PAGE 2

Treatment and/or Control Methods Employed	Implementation Time	Land Requirements
H. Vacuum filtration dewaters solids captured in step G.	15-18 months	10'x10' (batch) 20'x20' (continuous)
I. Filtration - effluent from Step H is treated by passage through a mixed-media filter unit (last step in BAT-1).	15-18 months	25'x25' (recirculation) 40'x40' (combination) 50'x50' (direct application)
J. Activated carbon columns - effluent from Step I is passed through activated carbon columns (last step in BAT-2).	18 months	50'x50'
K. Evaporation - effluent from Step H is passed through a vapor compression evaporation system to achieve zero discharge.	18 months	60'x60'
L. Recycle - distillate quality water from Step K is recycled to the cold rolling mill for reuse (last Step in BAT-3).	18 months	25'x25'

TABLE VIII-5

BPT COST SUMMARY
COLD ROLLING

Subdivision	Capital In-Place	Capital Required	Annual In-Place	Annual Required
Recirculation				
Single Stand	559.3	539.0	77.9	77.4
Multi Stand	4,217.7	1,609.4	121.7	276.7
Combination	7,573.2	0.0	1,291.8	0.0
Direct Application				
Single Stand	3,684.6	331.9	528.5	49.4
Multi Stand	6,587.3	2,606.4	769.6	442.0
Cold Rolling Total	22,622.1	5,086.7	2,789.5	845.5

All costs are in 1000's of 7/1/78 dollars.

TABLE VIII-6

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Single Stand Recirculation

Model Size-TPD : 450
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	8.6	7.2	31.8	32.5	6.4	6.5	33.1	82.3	208.4
Annual Costs ($ x 10^{-3})									
Capital	0.8	0.6	2.9	2.9	0.6	0.6	3.0	7.4	18.8
Operation & Maintenance	0.3	0.3	1.1	1.1	0.2	0.2	1.2	2.9	7.3
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								0.2	0.2
Hazardous Waste Disposal									
Oil Disposal							0.4		0.4
Energy & Power		0.2	0.2	0.2	0.3	0.2	0.3	1.6	3.0
Steam									
Waste Acid									
Crystal Disposal									
Chemical			*	*	*	0.6			0.6
TOTAL	1.2	1.2	4.3	4.2	1.2	1.6	5.0	12.2	30.9
Credits									
Scale									
Sinter									
Oil	1.0								1.0
Acid Recovery									
TOTAL CREDITS	1.0								1.0
NET TOTAL	0.2	1.2	4.3	4.2	1.2	1.6	5.0	12.2	29.9

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*Chemical costs are negligible.

KEY TO C&TT STEPS

A: Oil Separation
B: Equalization
C: Flocculation with Alum
D: Acid Addition
E: Neutralization With Lime
F: Flocculation With Polymer
G: Gas Flotation
H: Vacuum Filtration

TABLE VIII-7

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Cold Forming
Subdivision : Cold Rolling
: Multi Stand Recirculation

Model Size-TPD : 2,400
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x10^{-3})	52.5	39.9	99.5	43.4	32.3	20.0	88.0	118.1	493.7
Annual Costs ($ x10^{-3})									
Capital	4.7	3.6	8.9	3.9	2.9	1.8	7.9	10.6	44.3
Operation & Maintenance	1.8	1.4	3.5	1.5	1.1	0.7	3.1	4.1	17.2
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								3.5	3.5
Hazardous Waste Disposal									
Oil Disposal							9.6		9.6
Energy & Power		0.3	0.3	0.2	0.5	0.3	0.8	3.1	5.5
Steam									
Waste Acid									
Crystal Disposal									
Chemical			0.4	0.5	0.3	0.6			1.8
TOTAL	6.6	5.4	13.2	6.1	4.9	3.4	21.5	21.4	82.5
Credits									
Scale									
Sinter									
Oil	27.5								27.5
Acid Recovery									
TOTAL CREDITS	27.5								27.5
NET TOTAL	-20.9	5.4	13.2	6.1	4.9	3.4	21.5	21.4	55.0

KEY TO C&TT STEPS

A:	Oil Separation	E:	Neutralization With Lime
B:	Equalization	F:	Flocculation With Polymer
C:	Flocculation with Alum	G:	Gas Flotation
D:	Acid Addition	H:	Vacuum Filtration

TABLE VIII-8

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Cold Forming
Subdivision : Cold Rolling
: Combination

Model Size-TPD : 4,800
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x10^{-3})	135.6	290.3	223.0	142.2	187.6	29.2	185.3	347.0	1,540.2
Annual Costs ($ x10^{-3})									
Capital	12.2	26.1	20.0	12.8	16.9	2.6	16.7	31.2	138.5
Operation & Maintenance	4.7	10.2	7.8	5.0	6.6	1.0	6.5	12.1	53.9
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								46.5	46.5
Hazardous Waste Disposal									
Oil Disposal							11.6		11.6
Energy & Power		7.8	3.9	2.3	3.9	1.1	9.3	7.8	36.1
Steam									
Waste Acid									
Crystal Disposal									
Chemical			8.8	12.5	8.4	15.0			44.7
TOTAL	17.0	44.2	40.6	32.6	35.9	19.7	44.2	97.7	331.9
Credits									
Scale									
Sinter									
Oil	33.1								33.1
Acid Recovery									
TOTAL CREDITS	33.1								33.1
NET TOTAL	-16.1	44.2	40.6	32.6	35.9	19.7	44.2	97.7	298.8

KEY TO C&TT STEPS

A: Oil Separation
B: Equalization
C: Flocculation with Alum
D: Acid Addition
E: Neutralization With Lime
F: Flocculation With Polymer
G: Gas Flotation
H: Vacuum Filtration

TABLE VIII-9

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Cold Forming
Subdivision : Cold Rolling
: Single Stand Direct Application

Model Size-TPD : 2,000
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x10^{-3})	101.0	80.5	191.4	81.7	62.5	20.0	90.0	87.1	714.2
Annual Costs ($ x10^{-3})									
Capital	9.1	7.2	17.2	7.3	5.6	1.8	8.1	7.8	64.1
Operation & Maintenance	3.5	2.8	6.7	2.9	2.2	0.7	3.1	3.0	24.9
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								1.7	1.7
Hazardous Waste Disposal									
Oil Disposal							1.5		1.5
Energy & Power		1.9	0.8	0.3	0.8	0.3	1.6	1.6	7.3
Steam									
Waste Acid									
Crystal Disposal									
Chemical			1.1	1.6	1.0	1.9			5.6
TOTAL	12.7	12.0	25.9	12.1	9.7	4.7	14.4	14.2	105.7
Credits									
Scale									
Sinter									
Oil									
Acid Recovery	4.2								4.2
TOTAL CREDITS	4.2								4.2
NET TOTAL	8.5	12.0	25.9	12.1	9.7	4.7	14.4	14.2	101.5

KEY TO C&TT STEPS

A: Oil Separation	E: Neutralization With Lime
B: Equalization	F: Flocculation With Polymer
C: Flocculation with Alum	G: Gas Flotation
D: Acid Addition	H: Vacuum Filtration

TABLE VIII-10

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory	: Cold Forming	Model Size-TPD :	2,700
Subdivision	: Cold Rolling	Oper. Days/Year:	348
	: Multi Stand Direct Application	Turns/Day :	3

C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x10^{-3})	135.6	244.3	223.0	121.0	157.9	24.5	156.0	153.5	1,215.8
Annual Costs ($ x10^{-3})									
Capital	12.2	22.0	20.0	10.9	14.2	2.2	14.0	14.0	109.3
Operation & Maintenance	4.7	8.6	7.8	4.2	5.5	0.9	5.5	5.5	42.6
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								9.0	9.0
Hazardous Waste Disposal									
Oil Disposal							8.9		8.9
Energy & Power		7.8	3.1	2.3	2.6	0.9	6.2	4.7	27.6
Steam									
Waste Acid									
Crystal Disposal									
Chemical			6.6	9.4	6.3	11.3			33.6
TOTAL	17.0	38.5	37.6	26.8	28.7	15.3	34.7	33.0	231.6
Credits									
Scale									
Sinter									
Oil	25.4								25.4
Acid Recovery									
TOTAL CREDITS	25.4								25.4
NET TOTAL	-8.4	38.5	37.6	26.8	28.7	15.3	34.7	33.0	206.2

KEY TO C&TT STEPS

A: Oil Separation	E: Neutralization With Lime
B: Equalization	F: Flocculation With Polymer
C: Flocculation with Alum	G: Gas Flotation
D: Acid Addition	H: Vacuum Filtration

TABLE VIII-11

BAT/NSPS/PSES/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Single Stand Recirculation

Model Size - TPD: 450
Oper. Days/Year : 348
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1		BAT Alternative 2 Alt. 1 Plus:		BAT Alternative 3		
		I	Total	J	Total	K	L	Total
Investment ($ x 10^{-3})	208.4	8.0	8.0	175.8	183.8	529.8	7.8	537.6
Annual Costs ($ x 10^{-3})								
Capital	18.8	0.7	0.7	15.8	16.5	47.6	0.7	48.3
Operation & Maintenance	7.3	0.3	0.3	6.2	6.5	18.5	0.3	18.8
Land	0.6	0.1	0.1	0.1	0.2	0.1		0.1
Sludge Disposal	0.2							
Hazardous Waste Disposal								
Oil Disposal	0.4							
Energy & Power	3.0	0.2	0.2	0.8	1.0	7.8		7.8
Steam								
Waste Acid								
Crystal Disposal								
Chemical	0.6							
TOTAL	30.9	1.3	1.3	22.9	24.2	74.0	1.0	75.0
Credits								
Scale								
Sinter								
Oil	1.0							
Acid Recovery								
TOTAL CREDITS	1.0							
NET TOTAL	29.9	1.3	1.3	22.9	24.2	74.0	1.0	75.0

KEY TO TREATMENT ALTERNATIVES

PSES-1, NSPS-1, PSNS-1 = BPT
PSES-2, NSPS-2, PSNS-2 = BPT + BAT-1
PSES-3, NSPS-3, PSNS-3 = BPT + BAT-2
PSES-4, NSPS-4, PSNS-4 = BPT + BAT-3

KEY TO C&TT STEPS

I: Pressure Filtration
J: Granular Activated Carbon Adsorption
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-12

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Multi Stand Recirculation

Model Size - TPD: 2,400
Oper. Days/Year : 348
Turns/Day : 3

	Total	BAT Alternative 1		BAT Alternative 2 Alt. 1 Plus:		BAT Alternative 3		
C&TT Step	BPT	I	Total	J	Total	K	L	Total
Investment ($ x 10^{-3})	493.7	49.5	49.5	1,092.3	1,141.8	1,920.3	25.5	1,945.8
Annual Costs ($ x 10^{-3})								
Capital	44.3	4.4	4.4	98.2	102.6	172.6	2.3	174.9
Operation & Maintenance	17.2	1.7	1.7	38.2	39.9	67.2	0.9	68.1
Land	0.6	0.1	0.1	0.1	0.2	0.1	0.1	0.2
Sludge Disposal	3.5							
Hazardous Waste Disposal								
Oil Disposal	9.6							
Energy & Power	5.5	0.5	0.5	3.9	4.4	47.5		47.5
Steam								
Waste Acid								
Crystal Disposal								
Chemical	1.8							
TOTAL	82.5	6.7	6.7	140.4	147.1	287.4	3.3	290.7
Credits								
Scale								
Sinter								
Oil	27.5							
Acid Recovery								
TOTAL CREDITS	27.5							
NET TOTAL	55.0	6.7	6.7	140.4	147.1	287.4	3.3	290.7

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

I: Pressure Filtration
J: Granular Activated Carbon Adsorption
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-13

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Combination

Model Size - TPD: 4,800
Oper. Days/Year : 348
Turns/Day : 3

		BAT Alternative 1		BAT Alternative 2 Alt. 1 Plus:		BAT Alternative 3		
C&TT Step	Total BPT	I	Total	J	Total	K	L	Total
Investment ($ x 10^{-3})	1,540.2	561.0	561.0	3,427.3	3,988.3	11,968.2	330.0	12,298.2
Annual Costs ($ x 10^{-3})								
Capital	138.5	50.4	50.4	308.1	358.5	1,075.9	29.7	1,105.6
Operation & Maintenance	53.9	19.6	19.6	120.0	139.6	418.9	11.5	430.4
Land	0.6	0.1	0.1	0.1	0.2	0.2		0.2
Sludge Disposal	46.5							
Hazardous Waste Disposal								
Oil Disposal	11.6							
Energy & Power	36.1	7.8	7.8	46.7	54.5	934.2		934.2
Steam								
Waste Acid								
Crystal Disposal								
Chemical	44.7							
TOTAL	331.9	77.9	77.9	474.9	552.8	2,429.2	41.2	2,470.4
Credits								
Scale								
Sinter								
Oil	33.1							
Acid Recovery								
TOTAL CREDITS	33.1							
NET TOTAL	298.8	77.9	77.9	474.9	552.8	2,429.2	41.2	2,470.4

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

I: Pressure Filtration
J: Granular Activated Carbon Adsorption
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-14

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Single Stand Direct Application

Model Size - TPD: 2,000
Oper. Days/Year : 348
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1		BAT Alternative 2 Alt. 1 Plus:		BAT Alternative 3		
		I	Total	J	Total	K	L	Total
Investment ($ x 10^{-3})	714.2	153.3	153.3	1,904.1	2,057.4	2,586.5	46.2	2,632.7
Annual Costs ($ x 10^{-3})								
Capital	64.1	13.8	13.8	171.2	185.0	232.5	4.2	236.7
Operation & Maintenance	24.9	5.4	5.4	66.6	72.0	90.5	1.6	92.1
Land	0.6	0.1	0.1	0.1	0.2	0.2		0.2
Sludge Disposal	1.7							
Hazardous Waste Disposal								
Oil Disposal	1.5							
Energy & Power	7.3	0.8	0.8	6.2	7.0	132.3		132.3
Steam								
Waste Acid								
Crystal Disposal								
Chemical	5.6							
TOTAL	105.7	20.1	20.1	244.1	264.2	455.5	5.8	461.3
Credits								
Scale								
Sinter								
Oil	4.2							
Acid Recovery								
TOTAL CREDITS	4.2							
NET TOTAL	101.5	20.1	20.1	244.1	264.2	455.5	5.8	461.3

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

I: Pressure Filtration
J: Granular Activated Carbon Adsorption
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-15

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Multi Stand Direct Application

Model Size - TPD: 2,700
Oper. Days/Year : 348
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1		BAT Alternative 2 Alt. 1 Plus:		BAT Alternative 3		
		I	Total	J	Total	K	L	Total
Investment ($ x 10^{-3})	1,215.8	539.3	539.3	2,828.1	3,367.4	7,578.9	308.5	7,887.4
Annual Costs ($ x 10^{-3})								
Capital	109.3	48.5	48.5	254.2	302.7	681.3	27.7	709.0
Operation & Maintenance	42.6	18.9	18.9	99.0	117.9	265.3	10.8	276.1
Land	0.6	0.1	0.1	0.1	0.2	0.2		0.2
Sludge Disposal	9.0							
Hazardous Waste Disposal								
Oil Disposal	8.9							
Energy & Power	27.6	7.8	7.8	38.9	46.7	856.4		856.4
Steam								
Waste Acid								
Crystal Disposal								
Chemical	33.6							
TOTAL	231.6	75.3	75.3	392.2	467.5	1,803.2	38.5	1,841.7
Credits								
Scale								
Sinter								
Oil	25.4							
Acid Recovery								
TOTAL CREDITS	25.4							
NET TOTAL	206.2	75.3	75.3	392.2	467.5	1,803.2	38.5	1,841.7

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

I: Pressure Filtration
J: Granular Activated Carbon Adsorption
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-16

BAT COST SUMMARY
COLD ROLLING

Subdivision	BAT Alt. No. 1				BAT Alt. No. 2				BAT Alt. No. 3			
	Capital		Annual		Capital		Annual		Capital		Annual	
	In-Place	Required	In-Place	Required	In-Place	Required	In-Place	Required	In-Place	Required	In-Place	Required
Recirculation												
Single Stand	7.2	93.9	1.2	15.3	7.2	2,316.1	1.3	304.8	0	6,795.4	0	948.0
Multi Stand	80.0	891.2	10.8	120.0	80.0	22,243.8	10.8	2,864.4	0	38,038.2	0	5,682.3
Combination	1,209.7	4,592.5	16.8	637.7	1,209.7	40,039.2	168	5,549.2	0	127,194.0	0	25,549.7
Direct Application												
Single Stand	324.6	598.1	42.6	112.9	324.6	15,322.8	42.6	2,000.6	0	20,359.3	0	3,567.3
Multi Stand	1,260.2	3,930.7	0	724.7	1,260.2	31,151.0	916.5	3,583.0	0	75,916.0	0	17,726.1
Cold Rolling Total	2,881.7	10,106.4	222.6	1,610.6	2,881.7	111,072.9	1,139.4	14,302.0	0	268,302.9	0	53,473.4

All costs are in 1000's of 7/1/78 dollars.

TABLE VIII-17

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Multi Stand Recirculation

Model Size-TPD : 2,400
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	31.1	32.8	80.4	42.4	23.1	20.0	71.9	59.0	360.7
Annual Costs ($ x 10^{-3})									
Capital	2.8	2.9	7.2	3.8	2.1	1.8	6.5	5.3	32.4
Operation & Maintenance	1.1	1.1	2.8	1.5	0.8	0.7	2.5	2.1	12.6
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								0.9	0.9
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power							3.9		3.9
Steam		0.3	0.3	0.2	0.5	0.3	0.8	0.8	3.2
Waste Acid									
Crystal Disposal									
Chemical			0.1	0.2	0.2	0.6			1.1
TOTAL	4.0	4.4	10.5	5.7	3.7	3.4	13.8	9.2	54.7
Credits									
Scale									
Sinter									
Oil	11.1								11.1
Acid Recovery									
TOTAL CREDITS	11.1								11.1
NET TOTAL	-7.1	4.4	10.5	5.7	3.7	3.4	13.8	9.2	43.6

TABLE VIII-17
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

CATT Step	NSPS/PSNS Alternative 2 Alternative 1 Plus:		NSPS/PSNS Alternative 3 Alternative 1 Plus:			NSPS/PSNS Alternative 4 Alternative 1 Plus:		
	I	Total	I	J	Total	K	L	Total
Investment ($ x 10^{-3})	28.8	389.5	28.8	634.7	1,024.2	1,454.8	24.0	1,839.5
Annual Cost ($ x 10^{-3})								
Capital	2.6	35.0	2.6	57.1	92.1	130.8	2.2	165.4
Operation & Maintenance	1.0	13.6	1.0	22.2	35.8	50.9	0.8	64.3
Land	0.1	0.7	0.1	0.1	0.8	0.1	0.1	0.8
Sludge Disposal		0.9			0.9			0.9
Hazardous Waste Disposal								
Oil Disposal		3.9			3.9			3.9
Energy & Power	0.2	3.4	0.2	2.3	5.7	14.0		17.2
Steam								
Waste Acid								
Crystal Disposal								
Chemical		1.1			1.1			1.1
TOTAL	3.9	58.6	3.9	81.7	140.3	195.8	3.1	253.6
Credits								
Scale								
Sinter								
Oil		11.1			11.1			11.1
Acid Recovery								
TOTAL CREDITS		11.1			11.1			11.1
NET TOTAL	3.9	47.5	3.9	81.7	129.2	195.8	3.1	242.5

KEY TO CATT STEPS

A: Oil Separation
B: Equalization
C: Flocculation with Alum
D: Acid Addition
E: Neutralization with Lime
F: Flocculation with Polymer
G: Gas Flotation
H: Vacuum Filtration
I: Pressure Filtration
J: Granular Activated Carbon Adsorption
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-18

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Combination

Model Size-TPD : 4,800
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	135.6	175.6	223.0	118.3	131.6	22.0	112.2	263.2	1,181.5
Annual Costs ($ x 10^{-3})									
Capital	12.2	15.8	20.0	10.6	11.8	2.0	10.1	23.7	106.2
Operation & Maintenance	4.7	6.1	7.8	4.1	4.6	0.8	3.9	9.2	41.2
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								20.9	20.9
Hazardous Waste Disposal									
Oil Disposal							5.0		5.0
Energy & Power		4.7	2.3	1.6	1.6	0.8	6.2	6.2	23.4
Steam									
Waste Acid									
Crystal Disposal									
Chemical			3.8	5.4	3.6	6.3			19.1
TOTAL	17.0	26.7	34.0	21.7	21.7	9.9	25.3	60.1	216.4
Credits									
Scale									
Sinter									
Oil	14.3								14.3
Acid Recovery									
TOTAL CREDITS	14.3								14.3
NET TOTAL	2.7	26.7	34.0	21.7	21.7	9.9	25.3	60.1	202.1

TABLE VIII-18
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

	NSPS/PSNS Alternative 2		NSPS/PSNS Alternative 3			NSPS/PSNS Alternative 4		
	Alternative 1 Plus:		Alternative 1 Plus:			Alternative 1 Plus:		
C&TT Step	I	Total	I	J	Total	K	L	Total
Investment ($ x 10^{-3})	470.9	1,652.4	470.9	2,079.0	3,731.4	5,450.8	387.3	6,919.6
Annual Cost ($ x 10^{-3})								
Capital	42.3	148.5	42.3	186.9	335.4	490.0	25.8	622.0
Operation & Maintenance	16.5	57.7	16.5	72.8	130.5	190.8	10.1	242.1
Land	0.1	0.7	0.1	0.1	0.8	0.2	0.1	0.9
Sludge Disposal		20.9			20.9			20.9
Hazardous Waste Disposal								
Oil Disposal		5.0			5.0			5.0
Energy & Power	4.7	28.1	4.7	7.8	35.9	467.1		490.5
Steam								
Waste Acid								
Crystal Disposal								
Chemical		19.1			19.1			19.1
TOTAL	63.6	280.0	63.6	267.6	547.6	1,148.1	36.0	1,400.5
Credits								
Scale								
Sinter								
Oil		14.3			14.3			14.3
Acid Recovery								
TOTAL CREDITS		14.3			14.3			14.3
NET TOTAL	63.6	265.7	63.6	267.6	533.3	1,148.1	36.0	1,386.2

KEY TO C&TT STEPS

A: Oil Separation	H: Vacuum Filtration
B: Equalization	I: Pressure Filtration
C: Flocculation with Alum	J: Granular Activated Carbon Adsorption
D: Acid Addition	K: Vapor Compression Distillation
E: Neutralization with Lime	L: Recycle
F: Flocculation with Polymer	
G: Gas Flotation	

TABLE VIII-19

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Single Stand Direct Application

Model Size-TPD : 2,000
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	47.1	39.0	89.2	43.4	32.3	20.0	78.9	82.3	432.2
Annual Costs ($ x 10^{-3})									
Capital	4.2	3.5	8.0	3.9	2.9	1.8	7.1	7.4	38.8
Operation & Maintenance	1.6	1.4	3.1	1.5	1.1	0.7	2.8	2.9	15.1
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								1.7	1.7
Hazardous Waste Disposal									
Oil Disposal							0.4		0.4
Energy & Power		0.8	0.3	0.3	0.5	0.3	1.6	1.6	5.4
Steam									
Waste Acid									
Crystal Disposal									
Chemical			0.3	0.4	0.3	0.6			1.6
TOTAL	5.9	5.8	11.8	6.1	4.9	3.4	12.0	13.7	63.6
Credits									
Scale									
Sinter									
Oil	1.2								1.2
Acid Recovery									
TOTAL CREDITS	1.2								1.2
NET TOTAL	4.7	5.8	11.8	6.1	4.9	3.4	12.0	13.7	62.4

TABLE VIII-19
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2 Alternative 1 Plus: I	NSPS/PSNS Alternative 2 Total	NSPS/PSNS Alternative 3 Alternative 1 Plus: I	J	Total	NSPS/PSNS Alternative 4 Alternative 1 Plus: K	L	Total
Investment ($ x 10^{-3})	44.3	476.5	44.3	979.1	1,455.6	1,556.0	25.5	2,013.7
Annual Cost ($ x 10^{-3})								
Capital	4.0	42.8	4.0	88.0	130.8	139.9	2.3	181.0
Operation & Maintenance	1.6	16.7	1.6	34.3	51.0	54.5	0.9	70.5
Land	0.1	0.7	0.1	0.1	0.8	0.1	0.1	0.8
Sludge Disposal		1.7			1.7			1.7
Hazardous Waste Disposal								
Oil Disposal		0.4			0.4			0.4
Energy & Power	0.3	5.7	0.3	3.1	8.8	29.6		35.0
Steam								
Waste Acid								
Crystal Disposal								
Chemical		1.6			1.6			1.6
TOTAL	6.0	69.6	6.0	125.5	195.1	224.1	3.3	291.0
Credits								
Scale								
Sinter								
Oil		1.2			1.2			1.2
Acid Recovery								
TOTAL CREDITS		1.2			1.2			1.2
NET TOTAL	6.0	68.4	6.0	125.5	193.9	224.1	3.3	289.8

KEY TO C&TT STEPS

A:	Oil Separation	H:	Vacuum Filtration
B:	Equalization	I:	Pressure Filtration
C:	Flocculation with Alum	J:	Granular Activated Carbon Adsorption
D:	Acid Addition	K:	Vapor Compression Distillation
E:	Neutralization with Lime	L:	Recycle
F:	Flocculation with Polymer		
G:	Gas Flotation		

TABLE VIII-20

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Rolling
: Multi Stand Direct Application

Model Size-TPD : 2,700
Oper. Days/Year: 348
Turns/Day : 3

	NSPS/PSNS Alternative 1								
C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	135.6	201.4	223.0	121.0	141.5	22.0	128.6	138.2	1,111.3
Annual Costs ($ x 10^{-3})									
Capital	12.2	18.1	20.0	10.9	12.7	2.0	11.6	12.4	99.9
Operation & Maintenance	4.7	7.0	7.8	4.2	5.0	0.8	4.5	4.8	38.8
Land	0.1	0.1	0.1		0.1		0.1	0.1	0.6
Sludge Disposal								7.0	7.0
Hazardous Waste Disposal									
Oil Disposal							6.5		6.5
Energy & Power		5.4	2.3	1.6	2.3	0.8	7.8	4.7	24.9
Steam									
Waste Acid									
Crystal Disposal									
Chemical			4.8	6.8	4.5	8.1			24.2
TOTAL	17.0	30.6	35.0	23.5	24.6	11.7	30.5	29.0	201.9
Credits									
Scale									
Sinter									
Oil	18.4								18.4
Acid Recovery									
TOTAL CREDITS	18.4								18.4
NET TOTAL	-1.4	30.6	35.0	23.5	24.6	11.7	30.5	29.0	183.5

TABLE VIII-20
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

	NSPS/PSNS Alternative 2 Alternative 1 Plus:		NSPS/PSNS Alternative 3 Alternative 1 Plus:			NSPS/PSNS Alternative 4 Alternative 1 Plus:		
C&TT Step	I	Total	I	J	Total	K	L	Total
Investment ($ x 10^{-3})	539.3	1,650.6	539.3	2,332.5	3,983.1	6,250.7	308.5	7,670.5
Annual Cost ($ x 10^{-3})								
Capital	48.5	148.4	48.5	209.7	358.1	561.9	27.7	689.5
Operation & Maintenance	18.9	57.7	18.9	81.6	139.3	218.8	10.8	268.4
Land	0.1	0.7	0.1	0.1	0.8	0.2	0.1	0.9
Sludge Disposal		7.0			7.0			7.0
Hazardous Waste Disposal								
Oil Disposal		6.5			6.5			6.5
Energy & Power	5.4	30.3	5.4	9.3	39.6	545.0		569.9
Steam								
Waste Acid								
Crystal Disposal								
Chemical		24.2			24.2			24.2
TOTAL	72.9	274.8	72.9	300.7	575.5	1,325.9	38.6	1,566.4
Credits								
Scale								
Sinter								
Oil		18.4			18.4			18.4
Acid Recovery								
TOTAL CREDITS		18.4			18.4			18.4
NET TOTAL	72.9	256.4	72.9	300.7	557.1	1,325.9	38.6	1,548.0

KEY TO C&TT STEPS

A: Oil Separation
B: Equalization
C: Flocculation with Alum
D: Acid Addition
E: Neutralization with Lime
F: Flocculation with Polymer
G: Gas Flotation

H: Vacuum Filtration
I: Pressure Filtration
J: Granular Activated Carbon Adsorption
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-21

PSES COST SUMMARY
COLD ROLLING

Subdivision	PSES Alt. No. 1				PSES Alt. No. 2			
	Capital		Annual		Capital		Annual	
	In-Place	Required	In-Place	Required	In-Place	Required	In-Place	Required
Recirculation								
Single Stand	1.8	29.9	0.3	4.3	1.8	48.1	0.3	7.2
Multi Stand	2.5	27.9	0.3	3.0	2.5	95.7	0.3	12.2
Total	4.3	57.8	0.6	7.3	4.3	143.8	0.6	19.4

Subdivision	PSES Alt. No. 3				PSES Alt. No. 4			
	Capital		Annual		Capital		Annual	
	In-Place	Required	In-Place	Required	In-Place	Required	In-Place	Required
Recirculation								
Single Stand	1.8	447.6	0.3	59.3	1.8	1,251.6	0.3	174.7
Multi Stand	2.5	1,593.7	0.3	204.7	2.5	2,696.4	0.3	401.7
Total	4.3	2,041.3	0.6	264.0	4.3	3,948.0	0.6	576.4

All costs are in 1000's of 7/1/78 dollars.

No costs are presented for Combination and Direct Application since there are no mills which discharge to a POTW in these subdivisions.

TABLE VIII-22

ENERGY REQUIREMENTS SUMMARY
BPT,BAT AND PSES

Subdivision	BPT			BAT-1		BAT-2		BAT-3	
	No. of plants	Model kw-hr/yr	Subcategory kw-hr/yr	Model kw-hr/yr	Subcategory kw-hr/yr	Model kw-hr/yr	Subcategory kw-hr/yr	Model kw-hr/yr	Subcategory kw-hr/yr
Recirculation									
Single Stand	13	120,000	1,680,000	8,000	104,000	40,000	520,000	312,000	4,056,000
Multi Stand	21	220,000	4,620,000	20,000	420,000	176,000	3,696,000	1,900,000	39,900,000
Combination	10	1,444,000	14,440,000	312,000	3,120,000	2,180,000	21,800,000	37,368,000	373,680,000
Direct Application									
Single Stand	9	292,000	2,628,000	32,000	288,000	280,000	2,520,000	5,292,000	47,628,000
Multi Stand	10	1,104,000	11,040,000	312,000	3,120,000	1,868,000	18,680,000	34,256,000	342,560,000

Subdivision	PSES-1			PSES-2		PSES-3		PSES-4	
	No. of plants	Model kw-hr/yr	Subcategory kw-hr/yr	Model kw-hr/yr	Subcategory kw-hr/yr	Model kw-hr/yr	Subcategory kw-hr/yr	Model kw-hr/yr	Subcategory kw-hr/yr
Recirculation									
Single Stand	3	120,000	360,000	128,000	384,000	160,000	480,000	432,000	1,296,00
Multi Stand	3	220,000	660,000	240,000	720,000	396,000	1,188,000	2,120,000	6,360,000
Combination	0	1,444,000	0	1,756,000	0	3,624,000	0	38,812,000	0
Direct Application									
Single Stand	0	292,000	0	324,000	0	572,000	0	5,584,000	0
Multi Stand	0	1,104,000	0	1,416,000	0	2,972,000	0	35,360,000	0

NOTE: The BAT energy requirements are incremental over BPT. The PSES requirements are all inclusive.

TABLE VIII-23

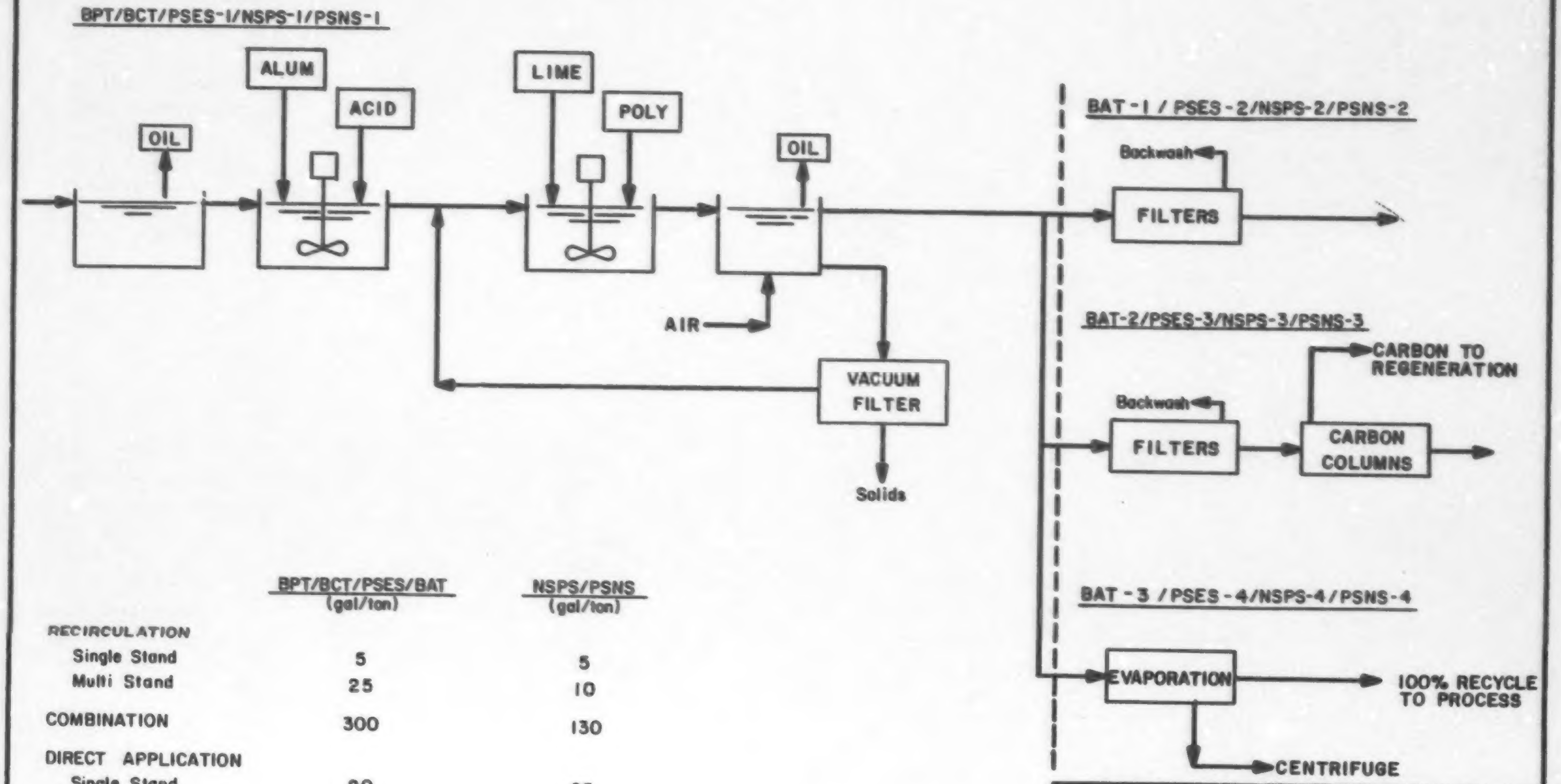
SOLID WASTE GENERATION SUMMARY
BPT AND PSES

DEWATERED SOLIDS

	BPT			PSES-1		
Subdivision	No. of Plants	Model tons/yr	Segment tons/yr	No. of Plants	Model tons/yr	Segment tons/yr
Recirculation						
Single Stand	13	40	520	3	40	120
Multi Stand	21	700	14,700	3	700	2,100
Combination	10	9,300	93,000	0	9,300	0
Direct Application						
Single Stand	9	340	3,060	0	340	0
Multi Stand	10	1,800	18,000	0	1,800	0

OIL AND GREASE

	BPT			PSES-1		
Subdivision	No. of Plants	Model gallons/yr	Segment gallons/yr	No. of Plants	Model gallons/yr	Segment gallons/yr
Recirculation						
Single Stand	13	5,710	74,230	3	5,710	17,130
Multi Stand	21	137,000	2,877,000	3	137,000	411,000
Combination	10	166,000	1,660,000	0	166,000	0
Direct Application						
Single Stand	9	21,400	192,600	0	21,400	0
Multi Stand	10	127,000	1,270,000	0	127,000	0


BPT/BCT/PSES-1/NSPS-1/PSNS-1
OIL
ALUM
ACID
LIME
POLY
OIL
AIR
VACUUM FILTER
Solids
BAT-1 / PSES-2/NSPS-2/PSNS-2
Backwash
FILTERS
BAT-2/PSES-3/NSPS-3/PSNS-3
Backwash
FILTERS
CARBON COLUMNS
CARBON TO REGENERATION
BAT-3 / PSES-4/NSPS-4/PSNS-4
EVAPORATION
100% RECYCLE TO PROCESS
CENTRIFUGE

	BPT/BCT/PSES/BAT (gal/ton)	NSPS/PSNS (gal/ton)
RECIRCULATION		
Single Stand	5	5
Multi Stand	25	10
COMBINATION	300	130
DIRECT APPLICATION		
Single Stand	90	25
Multi Stand	400	290

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING
TREATMENT MODELS SUMMARY

Dwn. 3/2/82

FIGURE VIII-1

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

Introduction

The Agency has promulgated Best Practicable Control Technology Currently Available (BPT) limitations which are based upon the same model treatment system used as the basis for the BPT limitations originally promulgated in March, 1976. However, dissolved iron is no longer being limited, and limitations have been established for toxic metal and toxic organic pollutants. A review of the treatment processes and effluent limitations for the cold rolling subdivision follows.

Identification of BPT

The BPT model treatment system is identical to the model used in the previous regulation. This system includes oil separation and equalization; chemical addition (alum and acid) to break any oil emulsions; flocculation with polymer and neutralization; and dissolved air flotation. This system is outlined in Figure IX-1.

The treatment configuration described above is installed at several cold rolling operations (i.e., 0060, 0584A, 0860B, and at many other plants). The system was developed based upon general practices within the subcategory and is an efficient way to treat cold rolling wastewaters. The BPT effluent limitations for the three types of cold rolling operations are presented in Table IX-1, along with the respective model effluent flows and concentrations.

Rationale for the Selection of BPT

Treatment Technology

As noted in Sections III and VII, each of the treatment system components incorporated in the BPT model treatment system is in use at a number of cold rolling operations. The efficiency of the BPT model treatment system has been demonstrated through its various applications in the industry.

The model treatment system has demonstrated the ability to significantly reduce total suspended solids and oil and grease. Moreover, the available data indicate that the BPT model treatment system is also capable of effectively removing toxic metal and toxic organic pollutants, along with the conventional pollutants.

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The Agency believes that other alternative means are also available to reduce or eliminate the discharge of toxic organic pollutants. In the preamble to the proposed regulation (46 FR 1858), the Agency solicited comments regarding whether "clean" rolling solutions could be used instead of those containing toxic organic compounds. No substantive comments were received. The Agency did, however, review available information and believes that some facilities may be able to change to "clean" rolling solutions. The Agency also concluded that cold rolling operating requirements are so complex, and highly variable given product quality considerations, that it is not possible to establish limitations based upon the expectation that the entire industry can use "clean" rolling solutions. Hence, the effluent limitations have not been established on this basis, although it may be an available option for some cold rolling operations. Cleaning solutions that do not contain chlorinated organic compounds are also available. These solutions can be used at cold rolling mills to minimize or eliminate the discharge of toxic organic compounds originating from this source. Additionally, the discharge of toxic organic pollutants can be reduced through better handling and disposal of waste oils and cleaning solutions which contain toxic organic compounds. These wastes should be collected and bled into the wastewater treatment system at a rate such that the influent pollutant loads remain within design constraints. This will prevent the system from being overloaded, and thereby, ensure effective operation of the wastewater treatment system. This in turn ensures efficient removal of toxic organic pollutants.

Model Treatment System Flows

The Agency developed the model flows recognizing the three types of cold rolling mills (recirculation, combination, and direct application). The model flows are different from the flows used to establish the orginal BPT limitations and were developed from a much larger data base than originally used. Furthermore, the Agency has established separate subsegments for single and multiple stand mills for the recirculation and direct application segments.

In developing the model flow rates, the Agency identified those plants which it believed are representative of well operated plants within each segment. The plants that were not considered to be representative of well operated plants are operated at much higher discharge flow rates. The Agency evaluated these high flows in conjunction with the thickness reduction and flow data presented in Table IX-7, and concluded that these flows are unjustifiably high and not required for product quality considerations. Thus, these plants (identified by asterisks on Tables IX-2 through IX-6) were not included in the development of the model flows. The flow data for those well operated plants were used to determine the average of the best flows. Table IX-2 lists the discharge flows for single stand recirculation mills. Table IX-3 lists the discharge flows for multiple stand recirculation mills. The average of the best flows for single stand mills is 3.7 gal/ton; while the same flow for multiple stand mills is 9.9 gal/ton. This analysis demonstrates the difference in flows for these two operations and justifies the establishment of separate subsegments for these operations. Similar data are presented in Tables IX-4 through IX-6 for combination mills, single stand direct application mills and multiple stand direct application mills, respectively. The average of the best flows and the model flows are listed on these tables and are summarized by subsegment in Table IX-1. Again the model flows for single stand (90 gal/ton) and multiple stand (400 gal/ton) direct application mills, justify establishing separate subsegments for these two operations. The model flow for combination mills is 300 gal/ton.

The Agency considered whether or not the thickness reduction achieved at the different types of cold rolling mills would affect the achievability of the model treatment system flow rates. The Agency did so because it thought that this factor might possibly affect the achievability of the model treatment system flow rates. The amount of heat generated in the process is related to thickness reduction, and the amount of applied rolling solution is determined, to a large extent, by the need to cool the work rolls and the product being rolled. However, as shown by the data presented in Table IX-7, the Agency found that the model treatment system flow rates are achieved at mills producing a wide range of thickness reductions. Based upon available information, the Agency believes that product quality considerations do not restrict the ability of the industry to achieve these flows, and that the limitations and standards should not be modified based upon the thickness reduction of the product rolled.

One company submitted information on the possible adverse effects the model flows may have on product quality. As discussed in the preceeding paragraph, the Agency evaluated the model flows and believes that the model flows will neither adversely affect product quality nor prevent the production of certain cold rolled products. The Agency believes that the model flows are well demonstrated, and that all cold rolling operations are able to comply with the applicable BPT limitations.

Wastewater Quality

The effluent concentrations used as the basis to establish the BPT limitations are presented in Table IX-1 along with the limitations. These concentrations were developed from sampling data collected at Plant 0684F. The analysis of the data is presented in Appendix A of Volume I. Table VII-8 presents a summary of the data acquired during the sampling survey. As shown in the table, two toxic organic pollutants (naphthalene and tetrachloroethylene) and four toxic metal pollutants (chromium, lead, nickel and zinc) have been selected for limitations at the BPT levels, in addition to total suspended solids, oil and grease and pH. The rationale for the selection of these toxic pollutants and respective concentrations are discussed below.

Conventional Pollutants and Dissolved Iron

The BPT limitations originally promulgated in 1976, established effluent limitations for total suspended solids, oil and grease, pH and dissolved iron. The Agency has promulgated BPT limitations for all of those pollutants, except dissolved iron. The concentration for the oil and grease limitations, and the pH limitations are the same as previously promulgated. The concentration for total suspended solids has been relaxed slightly from 25 mg/l to 30 mg/l, which will facilitate co-treatment of compatible steel finishing operation wastewaters. Limitations for these three conventional pollutants will ensure that the treatment system will be operated efficiently with respect to these pollutants. However, limitations for oil and grease are not adequate for ensuring effective control of the discharge of toxic organic pollutants.

Limitations for dissolved iron have not been retained. The Agency believes that the limitations for toxic metals (discussed below) will adequately control the discharge of metal pollutants contained in cold rolling wastewaters. This will also facilitate co-treatment with other compatible wastewaters, since dissolved iron is not limited in any of the other subcategories.

Toxic Metal Pollutants

The Agency detected eight toxic metal pollutants in the wastewaters from cold rolling operations. These toxic metals are readily removed by the BPT model treatment system described above. Although these metals are generally in a dissolved state, when the wastewaters are acidified to break the oil emulsions, they will be precipitated as metal hydroxides during the neutralization step preceding flotation. The precipitates, along with other suspended solids and oily material, are removed in the dissolved air flotation unit.

Acid pickling wastewaters are commonly used to acidify cold rolling wastewaters to break the oil emulsions. This practice reduces the need to purchase acid, and thereby, reduces operating costs. Acid pickling wastewaters contain many of the same toxic metals as cold rolling wastewaters, although at higher levels. These toxic metals, like those contained in cold rolling wastewaters, are precipitated in the neutralization step, and subsequently, removed in the dissolved air flotation unit. The data available to the Agency indicate that the performance of dissolved air flotation is similar to the performance of clarifiers (used in the model treatment system for acid pickling wastewaters) with respect to total suspended solids and oil and grease. Thus, the removal of metal hydroxide precipitates will also be similar. The toxic metals limited in the acid pickling subcategory are lead and zinc, for the sulfuric and hydrochloric acid segments, and chromium and nickel, for the combination acid segment. For those operations that are co-treated with electroplating or hot coating wastewaters that have high levels of toxic metals, pretreatment of the toxic metals in these wastewaters prior to co-treatment with cold rolling wastewaters, or pretreatment of cold rolling wastewaters prior to treatment for toxic metals, may be appropriate. This is common practice in the industry.

To facilitate co-treatment of cold rolling and acid pickling wastewaters, the Agency has selected lead and zinc as the toxic metals to be limited in the cold rolling subdivision. Chromium and nickel are limited in lieu of lead and zinc for operations rolling specialty steels.

The Agency has evaluated the data acquired through sampling visits to determine the appropriate effluent concentration. The methodology used to analyze these data and the results are presented in Appendix A of Volume I. The data base is the same as used to establish the model concentrations for the acid pickling subcategory. The Agency believes that this will facilitate the use of pickling wastewaters to treat cold rolling wastewaters. This is consistent with the Agency's co-treatment policy and will not result in significantly greater discharges of toxic metals than would occur if the wastewaters were treated separately. The toxic metal concentrations used to develop the BPT limitations are presented in Table IX-1.

Toxic Organic Pollutants

The Agency conducted an extensive sampling program of waste oil solutions, raw wastewaters, and treated and partially treated wastewaters at cold rolling mills. Through this study, the Agency found that contamination of cold rolling wastes by toxic organic pollutants is pervasive. Thirty toxic organic compounds were found at varying levels. Naphthalene was the most common pollutant found. As the data presented in Section VII show, naphthalene was found in more than 50% of the samples at levels greater than 0.1 mg/l. The presence of naphthalene is attributed to the oil solutions used at the cold rolling operations sampled.

Tetrachloroethylene was found in one-third of the samples. This pollutant is used as a solvent for cleaning the oil systems at cold rolling mills. Since cleaning is performed on a periodic basis, the presence and levels of tetrachloroethylene and other toxic organic pollutants contained in cleaning solvents will vary over time. Solvents containing other chlorinated organic pollutants are also used at cold rolling mills.

Naphthalene and tetrachloroethylene were both selected for limitation in the cold rolling subdivision. Naphthalene is characteristic of certain oils used, and tetrachloroethylene is characteristic of certain cleaning solutions used at cold rolling operations. Limitations established for these two pollutants will control indiscriminate dumping of waste oil and cleaning solutions, as well as the normal operations of the wastewater treatment system.

The Agency also conducted an intensive sampling program at Plant 0684F. This plant has the model BPT treatment system installed for treatment of cold rolling wastewaters, although it also receives electroplating wastewaters which cause high zinc discharges from the system. Preliminary data indicated the presence of toxic organic pollutants. The primary intent of the sampling survey was to determine the removal efficiency of dissolved air flotation with respect to toxic organic pollutants. The treatment system was sampled for 20 days for both conventional and toxic organic pollutants. The data indicates that dissolved air flotation is capable of removing toxic organic pollutants. Since most of these pollutants originate in the oils used for cold rolling, they are also removed from the wastewater with the oils.

The oil solution used at this mill was changed once during this intensive sampling period. The waste oil was collected in a storage tank and bled into the wastewater treatment system. During this period, contamination of the raw wastewater to the treatment system substantially increased, and tetrachloroethylene appeared at high levels. The effluent quality also noticeably degraded, although to a lesser extent than the percentage increase in raw wastewater loads. The treatment system was apparently overloaded by the increased discharge of waste oils and cleaning solution. A more gradual bleeding of these wastes to the treatment system could prevent deterioration in the effluent quality.

The performance data acquired for Plant 0684F, in conjunction with the sampling data obtained at other plants, were used to establish the model concentrations for the naphthalene and tetrachloroethylene effluent limitations. A summary of the statistical data is presented in Table VII-8 and a discussion is presented in the text of Section VII. After evaluation of these data, the Agency determined that it would be appropriate to establish only maximum limitations for naphthalene and tetrachloroethylene as shown in Table IX-1. The Agency believes that these effluent limitations, in conjunction with the limitations for oil and grease, will require efficient operation of the wastewater treatment system and better operating practices to control the discharge of waste oils and cleaning solutions. This will ensure that these pollutants will be treated.

Justification of BPT Limitations

Tables IX-8 and IX-9 present sampled plant effluent data which demonstrate the achievability of the limitations. The Agency considers these plants to be generally well designed and properly operated and typical of cold rolling operations. The data presented in Table IX-8 for single stand recirculation mills are for mills that achieve zero discharge through contract hauling. No data were available for single stand recirculation mills, combination mills and multistand direct application mills that could be used in these tables. The Agency is confident that those mills that properly treat and discharge their wastewaters will be able to meed the limitations. The achievability of the discharge flow rate for each segment is well demonstrated. The effluent concentrations for the limited pollutants are also well demonstrated in this subcategory. Since these wastewaters are similar in characteristics and treatability the same effluent concentrations are achievable. Thus, the effluent limitations established for each segment are achievable by operations in the respective segments.

The Agency believes that other plants which do not achieve the limitations have inadequate treatment. Effluent flows reported for some cold rolling operations are significantly less than the model flow. Yet the effluent limitations are not achieved, because the model treatment technology, or equivalent, was not installed, or because the wastewater treatment technology in place was not operated properly. The plants achieving the BPT flows are shown in Tables IX-2 through IX-6. Data presented in Appendix A of Volume I and Section VII detail the removal capabilities of the in the model treatment system.

TABLE IX-1

BPT EFFLUENT LIMITATIONS GUIDELINES
COLD FORMING SUBCATEGORY - COLD ROLLING

		Concentrations (mg/l) All Cold Rolling	Effluent Limitations (kg/kkg)				
			Recirculation			Direct Application	
			Single Stand	Multi Stand	Combination	Single Stand	Multi stand
Discharge flow (Gal/ton)	(1)		5	25	300	90	400
TSS	Avg	30	0.000626	0.00313	0.0375	0.0113	0.0501
	Max	60	0.00125	0.00626	0.0751	0.0225	0.100
O&G	Avg	10	0.000209	0.00104	0.0125	0.00375	0.0167
	Max	25	0.000522	0.00261	0.0313	0.00939	0.0417
Chromium(2)	Avg	0.4	0.0000083	0.0000417	0.000501	0.000150	0.000668
	Max	1.0	0.0000209	0.000104	0.00125	0.000375	0.00167
Lead	Avg	0.15	0.0000031	0.0000156	0.000188	0.0000563	0.000250
	Max	0.45	0.0000094	0.0000469	0.000563	0.000169	0.000751
Nickel(2)	Avg	0.3	0.0000063	0.0000313	0.000375	0.000113	0.000501
	Max	0.9	0.0000188	0.0000939	0.00113	0.000338	0.00150
Zinc	Avg	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max	0.3	0.0000063	0.0000313	0.000375	0.000113	0.000501
Napthalene	Avg	-	-	-	-	-	-
	Max	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
Tetrachloroethylene	Avg	-	-	-	-	-	-
	Max	0.15	0.0000031	0.0000156	0.000188	0.0000563	0.000250

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(1) Avg represents the monthly average limitations. Max represents maximum daily values.
(2) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

NOTE: pH is also regulated at BPT and is limited to 6.0 to 9.0 standard units for all cold rolling operations.

TABLE IX-2

BPT DISCHARGE FLOW DETERMINATION
COLD ROLLING: RECIRCULATION - SINGLE STAND

Plant Code	Discharge Flow (GPT)	Basis
760 (03-07)	0	DCP
580C (04&05)	0	DCP
528 (02)	0.02	DCP
528 (01)	0.03	DCP
060E	0.05	Sampling Visit
528 (03)	0.09	DCP
284A (01)	0.1	DCP
580C (03)	0.1	DCP
176 (08)	0.27	Sampling Visit
256A (01&02)	0.5	DCP
256B (01)	0.8	DCP
856P (01-21)	0.8	DCP
112A (07)	3.5	DCP
684D (01-07)	5.7	DCP
020B (01,02,04,05), 020C (01-08)	8.8	Sampling Visit
760 (01)	16.6	DCP
760 (02)	26.3	DCP
248B (01)	57.0*	Sampling Visit

Average of all discharge flow values = 6.7 gal/ton
"Average of the Best" flow values = 3.7 gal/ton
Use = 5.0 gal/ton

*Flow values marked with an asterisk were omitted from the "Average of the Best" flow calculation.

TABLE IX-3

BPT DISCHARGE FLOW DETERMINATION
COLD ROLLING: RECIRCULATION - MULTI STAND

Plant Code	Discharge Flow (GPT)	Basis
432C (01)	0.2	Sampling Visit
060 (01)	0.4	DCP
060 (03)	0.8	DCP
060 (02)	0.9	DCP
584F (02,03,05)	1.1	Sampling Visit
320 (02)	2.5	DCP
248B (03)	4.1	Sampling Visit
684F (03)	4.3	DCP
864B (01)	5.1	DCP
864B (03)	7.3	DCP
684F (02)	8.7	DCP
384A (03)	10.0	DCP
580C (01)	12.5	DCP
580C (02)	12.5	DCP
112D (01)	17.5	Sampling Visit
060B (03)	17.7	Sampling Visit
528B (01)	30.2	DCP
384A (02)	43.0	DCP
684B (01)	144.0*	DCP
864B (02)	354.0*	DCP
860B (04)	687.0*	DCP
684I (01)	751.0*	DCP
860B (01)	1283.0*	DCP
948C (03)	1369.0*	DCP

Average of all discharge flow values = 199 gal/ton
"Average of the Best" flow values = 9.9 gal/ton
Use = 25 gal/ton

*Flow values marked with an asterisk were omitted from the "Average of the Best" flow calculation.

TABLE IX-4

BPT DISCHARGE FLOW DETERMINATION
COLD ROLLING - COMBINATION

Plant Code	Discharge Flow (GPT)	Basis
868A-03	25	DCP
868A-01	54	DCP
584A-02	55	Sampling Visit
856F-01	112	Sampling Visit
920C-01	114	DCP
432D-01	156	Sampling Visit
856F-02	179	DCP
948C-02	207	Sampling Visit
860B-03	325	DCP
868A-02	481	DCP
584E-01	512	Sampling Visit
948C-01	870	DCP
948C-04	1500*	Sampling Visit

Average of all flow values : 353 GPT
"Average of the Best" value: 258 GPT
use: 300 GPT

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* Flow value marked with an aserisk were omitted from the "Average of the Best" flow calculation.

TABLE IX-5

BPT DISCHARGE FLOW DETERMINATION
COLD ROLLING: DIRECT APPLICATION - SINGLE STAND

Plant Code	Discharge Flow (GPT)	Basis
284A (02)	0.5	DCP
684I (02)	23	DCP
176 (02)	233	Sampling Visit

Average of all discharge flow values = 86 gal/ton
"Average of the Best" flow values = 86 gal/ton
Use = 90 gal/ton

TABLE IX-6

BPT DISCHARGE FLOW DETERMINATION
COLD ROLLING - DIRECT APPLICATION - MULTI STAND

Plant Code	Discharge Flow (GPT)	Basis
684C-02	142	DCP
860B-01	168	DCP
112B (01-06)	238	DCP
112A-02	246	DCP
384A-01	262	DCP
920A-01	273	DCP
856F-03	287	DCP
584F-03	424	Sampling Visit
112A-01	481	DCP
584A-01	603	DCP
112A-06	607	DCP
948A-02	864	DCP
948A-01	939*	DCP
584C-01	1426*	DCP
920G-02	1477*	DCP
920G-01	1604*	DCP
112A-05	3081*	DCP

Average of all discharge flow values = 772 GPT
"Average of the Best" flow values = 383 GPT
Use = 400 GPT

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* Flow values marked with an asterisk were omitted from the "Average of the Best" flow calculation.

TABLE IX-7

DISCHARGE FLOW AND THICKNESS PRODUCTION COLD ROLLING

Subcategory	BPT/BAT Model Flow (GPT)	Plant Reference Code	Product(s)	Percent Reduction	Discharge Flow(GPT)
Recirculation: Single Stand	5	112A(07)	Strip	6	3.5
		176(08)	Strip	12-83	0.27
		284(01)	Strip	0-33	0.1
		580C(03)	Strip	38-59	0.1
		580C(04&05)	Strip	0-97	<0.1
		684D(01-07)	Strip	2-50	5.7
Recirculation: Multi Stand	25	060(01)	Strip	36-56	0.4
		060(02)	Strip	62-82	0.9
		060(03)	Strip	32-80	0.8
		248B(03)	Strip	75	4.1
		384A(03)	Strip	50-79	10.0
		432C(01)	Sheet	32-81	0.2
		584F(02,03,05)	Strip	63-91	1.1
		864B(01)	Strip	58-89	5.1
		864B(03)	Strip	41-89	7.3
Combination	300	432D(01)	Strip	0-86	156
		584A(02)	Strip	0-70	55
		868A(01)	Strip	28-84	54
		868A(02)	Strip	28-33	25
		920C(01)	Strip	0-77	114
Direct Application: Multi Stand	400	384A(01)	Strip	71-86	262
		584F(03)	Strip	82-91	424
		684C(02)	Sheet	0-22	142
		860B(01)	Strip	30	168
		920A(01)	Strip	11-70	273

TABLE IX-8

JUSTIFICATION OF BPT
COLD ROLLING: RECIRCULATION

	Discharge Flow (gal/ton)	kg/kkg of Product TSS	Oil & Grease	Chromium	Lead	Nickel	Zinc	Naphthalene	Tetrachloro-ethylene	pH (Units)	C&TT Components
1. Single Stand											
BPT	5	0.000626	0.000209	0.0000083	0.0000031	0.0000063	0.0000021	0.0000021	0.0000031	6.0 to 9.0	E,SS,NA,FLP,FLL, EB,VF,GF
Plant Visits											
* 321A (684D)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	SS, Filter
* 321B (684D)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	SS, Filter
* 321C (684D)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	SS, Filter
* 318 (856P)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	SS, Filter
2. Multi Stand											
BPT	25	0.00313	0.00104	0.0000417	0.0000156	0.0000313	0.0000104	0.0000104	0.0000156	6.0 to 9.0	E,SS,NA,FLP,FLL, EB,VF,GF
Plant Visits											
102 (384A 02&03)	49	0.027	0.0075	<0.000006	<0.000010	<0.000005	0.000003	0.00	0.00	8.2	PSP,EB,CL
306 (248B-03)	3.5	0.00076	0.0019	0.000003	0.000002	0.000005	0.000005	**	0.00	5.8 to 6.8	Surge Tank, EB, OB,SB
* 308 (320)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	SB,SS,Filter
* 310 (432C)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
X-2 (060B-03)	4.0	0.0015	0.00030	NA	NA	NA	NA	NA	NA	7.8	EB,GF,CL,SS
BB-2 (060-03)	16.0	0.00013	0.00040	NA	NA	NA	NA	NA	NA	7.7	DN,EB,T,FLP,FP, ML,CL,SL,SS,VF
EE-2 (112D-01)	17.4	0.00015	0.00029	NA	NA	NA	NA	NA	NA	7.8	CR,FLP,NL,NW,CL, SL,SS
684F-03	4.3	0.00028	0.00013	0.0000016	0.0000023	0.0000036	0.0000024	**	**	-	EB,GF,SS

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* These plants employ contract haulers to dispose of some or all of their oils and solutions.
** Value is less than 0.000001 kg/kkg.

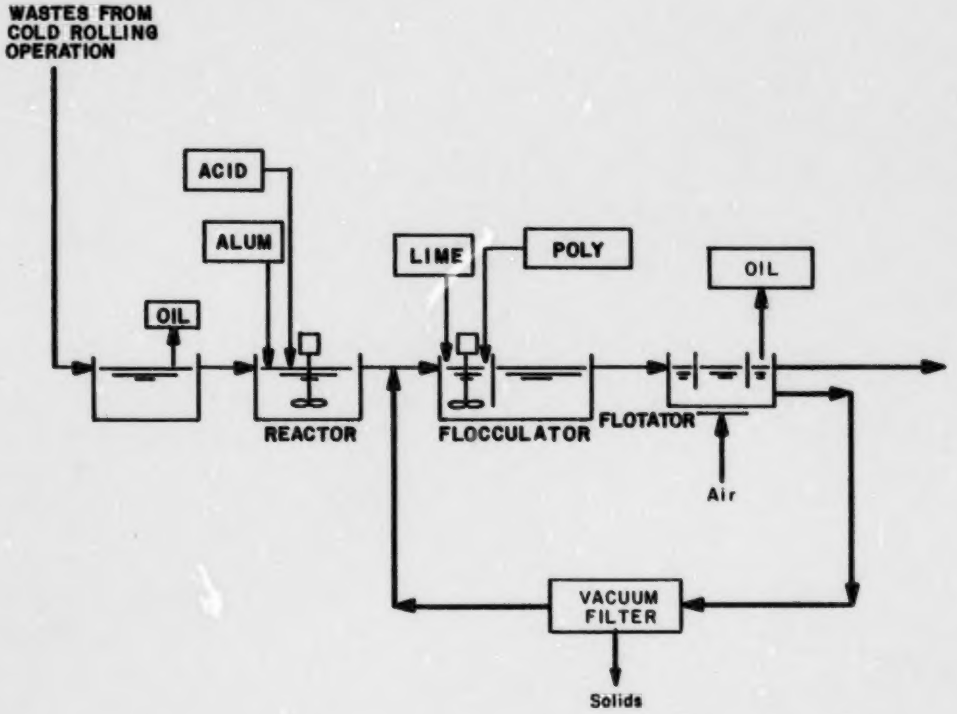
TABLE IX-9

JUSTIFICATION OF BPT
COLD ROLLING: DIRECT APPLICATION

	Discharge Flow (gal/ton)	kg/kkg of Product								pH (Units)	C&TT Components
		TSS	Oil & Grease	Chromium	Lead	Nickel	Zinc	Naphthalene	Tetrachloro-ethylene		
1. Single Stand BPT	90	0.0113	0.00375	0.000150	0.0000563	0.000113	0.0000375	0.0000375	0.0000563	6.0 to 9.0	E,SS,MA,FLP, FLL,EB,VF,GF
Plant Visits											
106 (112B-01,03-06)	670	0.00039	0.0027	**	**	**	**	**	0.0	NA	E,SS,FSP,MW,T

**Value is less than 0.000001 kg/kkg.

NA: Not Analyzed


WASTES FROM
COLD ROLLING
OPERATION
OIL
ACID
ALUM
REACTOR
LIME
POLY
FLOCCULATOR
FLOTATOR
OIL
Air
VACUUM
FILTER
Solids

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD ROLLING
BPT MODEL

Dwn.7/9/80

FIGURE IX-1

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

Introduction

This section identifies three BAT alternative treatment systems and the resulting effluent levels considered for the cold rolling subdivision. In addition, the rationale for the selection of treatment technologies, their discharge flow rates, and the limitations are presented. Previously, the three types of cold rolling mills (recirculation, combination, and direct application) were discussed individually. The BAT alternative treatment technologies apply to all three types.

Identification of BAT

Based upon the information contained in Sections III through VIII, the Agency developed the following treatment technologies (as add-ons to the BPT treatment system model) as BAT alternative treatment systems for cold rolling operations.

1. BAT Alternative 1

   The first BAT Alternative includes mixed-media filtration to further treat the effluent from the BPT treatment system. Filtration of the BPT discharge removes toxic metal pollutants in particulate form and suspended solids and oils that entrain toxic organic pollutants.

2. BAT Alternative 2

   This alternative includes granular activated carbon following the filtration step outlined above to reduce toxic organic pollutants present in the filtered discharge.

3. BAT Alternative 3

   Alternative 3 is a zero discharge system which treats the BPT discharge in a vapor compression distillation system.

The three BAT alternative treatment systems described above are illustrated in Figure VIII-1. The treatment technologies shown represent those technologies in use at one or more plants or demonstrated in other wastewater treatment applications. These systems are capable of attaining the respective BAT effluent levels. The applicability of each treatment method is reviewed below. Table X-1 contains effluent limitations, model flows and concentrations associated with BAT Alternatives 1 and 2. BAT Alternative 3 results in zero discharge.

Investment and annual costs for the BAT alternative treatment systems are presented in Section VIII.

Rationale for the Selection of the BAT Alternatives

This section presents the rationale for selecting the BAT alternative treatment systems, and a discussion on the model flow rates, the pollutants to be limited and the concentration levels of the limited pollutants.

Treatment Technologies

Mixed-media filtration has been selected as Alternative 1, due to its ability to reduce the levels of particulate toxic metal and toxic organic pollutants entrained in the oils. Although filtration is not expected to remove substantial amounts of toxic organic pollutants, it is expected to significantly reduce the pollutant load of conventional and toxic inorganic pollutants discharged from the cold rolling operations.

Four plants have filtration systems which treat cold rolling wastewaters, one of which has been sampled. At this plant, the filtration step was used as an intermediate treatment step, with the filter discharge receiving additional treatment in a thickener. The oil and solids concentrations entering the filter were extremely high, which greatly hindered the efficiency of the filter. The configuration and operation of this treatment system is different than BAT Alternative 1, in which the filter is used as the final treatment step, and therefore, treats a much lower pollutant load. As a result, the filtration data for this plant have not been used to establish performance levels. The levels achieved with filtration are based upon the performance of filter systems in other subcategories. Refer to Volume I for more details.

Alternative 2 includes granular activated carbon following the mixed-media filtration system described above. The carbon system was selected for removal of toxic organic pollutants based upon performance of activated carbon systems on similar wastewaters.

Although toxic organic pollutants have been found in raw cold rolling wastewaters, at present, carbon systems are not installed at any cold rolling mills. However, activated carbon is successfully used to treat cokemaking wastewaters and wastewaters in other industrial categories with similar organic contamination. Activated carbon is expected to be equally effective for treating cold rolling wastewaters.

Alternative 3 makes use of a vapor compression distillation system, as it is one of the least costly evaporation systems available. However, it is energy intensive and expensive to operate. This system was considered, since it may be the only technically feasible way to achieve zero discharge at all cold rolling operations.

Flows

The Agency is unaware of flow reduction methods that may be universally applicable to existing cold rolling operations. Recirculation of rolling solutions is widely practiced. However, due to the configuration of certain mills, not all combination or direct application mills can convert to the recirculating mode. At others, major reconstruction of the mill would be necessary resulting in prohibitively high costs.

As a result, the Agency has used the same well demonstrated model flows that were used to develop the BPT limitations. The development of these flows is discussed in Section IX.

Wastewater Quality

The toxic pollutants limited at BPT were also considered for limitation at the BAT level. The rationale for selection of these pollutants was presented in Section IX.

Following are the average effluent concentrations included in each BAT alternative. The maximum values appear below enclosed in parentheses.

	BAT Concentration Bases (mg/l)		
	BAT-1	BAT-2	BAT-3
Naphthalene	(0.1)	(0.3)	-
Tetrachloroethylene	(0.15)	(0.15)	-
Chromium	0.1(0.3)	0.1(0.3)	-
Lead	0.1(0.3)	0.1(0.3)	-
Nickel	0.1(0.3)	0.1(0.3)	-
Zinc	0.1(0.3)	0.1(0.3)	-

No effluent concentrations are presented for BAT Alternative 3, since this alternative results in zero discharge.

Toxic Organic and Inorganic Pollutants

Toxic organic and toxic metal pollutants are present in the raw and treated wastewater from cold rolling operations. For this reason, the Agency examined BAT alternative treatment systems with the intent of further reducing the levels of toxic pollutants.

Alternative 1 is designed to remove particulate metals and organics that may be entrained in oils. The Agency has used the available data to establish the effluent concentrations for toxic metals. The analysis of these data and the results are presented in Appendix A of Volume I. As at BPT, the toxic metal concentrations are the same as those used in the acid pickling subcategory to facilitate the use of pickling wastewaters to treat cold rolling wastewaters. For toxic organic pollutants, the Agency projects that filtration will produce similar effluent quality as achieved through the BPT treatment system. The concentration for the toxic organic pollutants are, therefore, the same concentrations used to establish the BPT limitations. The concentrations used to develop the effluent limitations are presented in Table X-1.

Alternative 2 consists of filtration and carbon adsorption. This system is also effective at removing toxic metals, oils, and suspended solids. However, activated carbon was considered primarily to further reduce organic contamination in the wastewaters. The Agency used data from the two activated carbon systems installed in the industry (which treat cokemaking wastewaters) and available treatability data to estimate the performance of activated carbon for cold rolling wastewaters. The average performance data are presented and reviewed in Table VI-1 of Volume I. These data were used, since activated carbon performance data specific to cold rolling wastewaters are not available. The concentrations used to develop the effluent limitations are listed in Table X-1.

Finally, Alternative 3 is a zero discharge system. Vapor compression distillation has not been demonstrated in the industry.

Effluent Limitations for Alternative Treatment Systems

The effluent limitations associated with BAT alternative treatment systems were calculated by multiplying the model effluent flows for each alternative treatment system by the concentration of each pollutant and an appropriate conversion factor. Table X-1 presents the effluent limitations developed for BAT Alternatives 1 and 2. BAT Alternative 3 results in zero discharge.

Selection of a BAT Alternative

None of the BAT alternatives were selected. BAT Alternative 1 was rejected, since the data indicates that no substantial effluent reduction over that achieved at BPT would result from its application. BAT Alternative 3 was not selected because of its high costs and energy consumption.

In the absence of performance data specific to cold rolling wastewaters, the Agency is not confident that the effluent limitations associated with BAT Alternative 2 are achievable. Cold rolling wastewaters are not the same as cokemaking wastewaters. The general wastewater treatability data, that were also considered in projecting the performance of activated carbon, was developed using single compound solutions. Although these data indicate achievable levels, the particular application of activated carbon to cold rolling wastewaters could produce a different effluent quality and thus, affect a discharger's ability to comply with the limitations.

Based upon the above considerations the Agency has promulgated BAT limitations for the toxic organic and toxic metal pollutants at the same levels as the respective BPT limitations. These limitations are presented in Table X-1.

Site Specific BAT Limitations

As noted in Section IX, the contamination of cold rolling wastewaters by toxic organic pollutants is highly variable, both in terms of the toxic organic pollutants found and the levels at which these pollutants are found. The Agency has promulgated daily maximum BAT limitations for naphthalene and tetrachloroethylene, which are common to many cold rolling solutions and oil system cleaning solutions, respectively. However, upon review of data at the cold rolling operations sampled for toxic pollutants, the Agency concluded that it is not possible to establish nationwide effluent limitations for the other toxic organic pollutants found because of their highly variable occurrence. Limitations for other toxic organic pollutants should be established at the permit writing stage. Reference is made to Volume I for NPDES guidance on possible approaches to establishing those limitations.

Demonstration of BAT Effluent Limitations

Tables IX-7 through IX-9 present a list of those plants for which the Agency has data that achieve the BAT effluent limitations.

TABLE X-1

BAT ALTERNATIVE NOS. 1, 2, & 3 EFFLUENT LIMITATIONS GUIDELINES COLD ROLLING

			BAT Nos. 1 and 2 Effluent Limitations (kg/kkg)*				
			Recirculation			Direct Application	
		Concentration Basis	Single Stand	Multi Stand	Combination	Single Stand	Multi Stand
Discharge flow (gal/ton)	(1)		5	25	300	90	400
Chromium(2)	Avg	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max	0.3	0.0000063	0.0000313	0.000376	0.000113	0.000501
Lead	Avg	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max	0.3	0.0000063	0.0000313	0.000376	0.000113	0.000501
Nickel(2)	Avg	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max	0.3	0.0000063	0.0000313	0.000376	0.000113	0.000501
Zinc	Avg	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max	0.3	0.0000063	0.0000313	0.000376	0.000113	0.000501
Naphthalene	Avg	-	-	-	-	-	-
	Max	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
Tetrachloroethylene	Avg	-	-	-	-	-	-
	Max	0.15	0.0000031	0.0000156	0.000188	0.0000563	0.000250

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(1) Avg represents the monthly average limitations. Max represents maximum daily values.

(2) The limitations for chromium and nickel shall be applicable in lieu of these for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

* Effluent limitations for BAT Alternative No. 3 are zero kg/kkg since this alternative is a zero discharge system.

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

Introduction

The 1977 Amendments added Section 301(b)(2)(E) to the Act, establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(a)(4) [biochemical oxygen demanding pollutants (BOD_5), total suspended solids (TSS), fecal coliform, and pH], and any additional pollutants defined by the Administrator as "conventional" (oil and grease, 44 FR 44501, July 30, 1979).

BCT is not an additional limitation but replaces BAT for the control of conventional pollutants. In addition to other factors specified in section 304(b)(4)(B), the Act requires that BCT limitations be assessed in light of a two part "cost-reasonableness" test. American Paper Institute v. EPA, 660 F.2d 954 (4th cir. 1981). The first test compares the cost for private industry to reduce its conventional pollutants with the costs to publicly owned treatment works for similar levels of reduction in their discharge of these pollutants. The second test examines the cost-effectiveness of additional industrial treatment beyond BPT. EPA must find that limitations are "reasonable" under both tests before establishing them as BCT. In no case may BCT be less stringent than BPT.

EPA published its methodology for carrying out the BCT analysis on August 29, 1979 (44 FR 50732). In the case mentioned above, the Court of Appeals ordered EPA to correct data errors underlying EPA's calculation of the first test, and to apply the second cost test. (EPA had argued that a second cost test was not required.)

Because of the remand in American Paper Institute v. EPA (No. 79-115), the Agency did not promulgate BCT limitations except for those operations for which the BAT limitations are no more stringent than the respective BPT limitations. Cold forming is one of the subcategories where BAT was promulgated equal to BPT. The Agency has concluded that BCT limitations more stringent than BPT are not appropriate.

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS

Introduction

This section identifies the NSPS alternative treatment systems considered by the Agency, the resulting alternative standards for cold rolling operations, the rationale for selecting the NSPS model flow rates, and the effluent standards.

The NSPS alternative treatment systems described below apply to all three types of cold rolling operations. Discussions with industry representatives, mill manufacturers, and an analysis of the DCP responses indicate recirculation type cold rolling mills are likely to be the most prevalent type of mill constructed in the future. Recirculation systems are used on all types of steels and at mills that process all types of products and thicknesses. Although clean water may be required on the entry or exist stands of some mills, the Agency believes that for new sources, this water can be treated and reused to a high degree. Nevertheless, to accommodate future installations of all types of cold rolling mills, the Agency has promulgated NSPS for the same segments as existing sources.

Identification of NSPS

The four NSPS alternative treatment systems are illustrated in Figure VIII-1. These systems are the same as the BPT and BAT alternative treatment systems discussed in detail in Sections IX and X. The standards, model flows and concentration bases are presented in Tables XII-1 and XII-2, for each of the alternative treatment systems, except for NSPS Alternative 4, which achieves zero discharge. The costs for the alternatives are presented in Section VIII.

NSPS Alternative 1

Alternative 1 consists of an equalization basin equipped with an oil skimmer, chemical addition steps to break the oil emulsions, a flocculation tank and an air flotation system.

NSPS Alternative 2

Alternative 2 includes the components of Alternative 1 plus a mixed-media filtration system to further reduce the pollutant levels. The standards achieved with this alternative are presented in Table XII-2.

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NSPS Alternative 3

Alternative 3 includes all of the components of Alternative 2, except that the filtered effluent is further treated in granular activated carbon columns. The standards achieved with this alternative are presented in Table XII-2.

NSPS Alternative 4

In this alternative, the discharge from Alternative 1 is processed by vapor compression distillation. The condensate is recycled to the process for reuse. Zero discharge is achieved.

Rationale for Selection of NSPS

The NSPS alternative treatment systems for cold rolling operations are similar to the BPT and BAT alternative treatment systems described in Sections IX and X, respectively. The detailed rationale presented in these sections is applicable to NSPS. The pollutants selected for limitation and the effluent quality resulting from the application of the NSPS alternative treatment systems are the same as the respective BPT and BAT concentrations. Detailed discussions on the development of the effluent concentrations are also presented in Sections IX and X.

Treatment Technology

As noted in Sections IX and X, the use of gas flotation and filtration is demonstrated not only within the steel industry, but also within the cold rolling subdivision. Carbon adsorption and vapor compression distillation have not been demonstrated at cold rolling operations.

Flow Rates

The NSPS model flow rates have been developed using the best demonstrated flow rates for each segment of the cold rolling subdivision. The discharge flows reported by the industry are presented in Tables IX-2 through IX-6 in Section IX for each segment and subsegment. The NSPS model flow for single stand recirculation mills is the same as the BPT model flow, i.e., 5 gal/ton. The Agency believes it is appropriate to set the NSPS model flow at that level. The best demonstrated flows for each of the other segments and subsegments, along with the number and percentage of mills achieving these flow rates, are listed in Table XII-3.

Selection of an NSPS Alternative

The Agency selected NSPS Alternative 1 (depicted in Figure XII-1) as the NSPS model treatment system upon which NSPS are based. This treatment system includes well demonstrated technologies and provides for removal of suspended solids, oils, toxic organic pollutants, and toxic metals found in cold rolling wastewaters. The other NSPS alternatives were rejected for the same reasons set forth for rejecting these alternatives at the BAT level. These reasons are discussed in Section X. Moreover, neither carbon adsorption nor vapor compression distillation has been demonstrated for treating cold rolling wastewaters. As noted in Section X, NSPS for these toxic organic pollutants not specifically limited must be developed on a site-specific basis.

Demonstration of NSPS

Tables XII-4 and XII-5 present data from sampled plants which demonstrate the NSPS. The tables are the same as those presented in Section IX (Tables IX-8 and IX-9). Thus the discussion presented in Section IX regarding these tables is also relevant to NSPS.

TABLE XII-1

NSPS ALTERNATIVE NO. 1 EFFLUENT LIMITATIONS GUIDELINES
COLD ROLLING

Discharge Flow (gal/ton)	(1)	Concentration Basis	NSPS Effluent Limitations (kg/kkg) Recirculation Single Stand 5	NSPS Effluent Limitations (kg/kkg) Recirculation Multi Stand 10	NSPS Effluent Limitations (kg/kkg) Combination 130	NSPS Effluent Limitations (kg/kkg) Direct Application Single Stand 25	NSPS Effluent Limitations (kg/kkg) Direct Application Multi Stand 290
Total Suspended Solids	Avg.	30	0.000626	0.00125	0.0163	0.00313	0.0363
	Max.	60	0.00125	0.00250	0.0325	0.00626	0.0726
Oil & Grease	Avg.	10	0.000209	0.000417	0.00542	0.00104	0.0121
	Max.	25	0.000522	0.00104	0.0136	0.00261	0.0302
Chromium[2]	Avg.	0.4	0.0000083	0.0000167	0.000217	0.0000417	0.000484
	Max.	1.0	0.0000209	0.0000417	0.000542	0.000104	0.00121
Lead	Avg.	0.15	0.0000031	0.0000063	0.0000814	0.0000156	0.000182
	Max.	0.45	0.0000094	0.0000188	0.000244	0.0000469	0.000544
Nickel[2]	Avg.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
	Max.	0.9	0.0000188	0.0000375	0.000488	0.0000939	0.00109
Zinc	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Naphthalene	Avg.	-	-	-	-	-	-
	Max.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
Tetrachloroethylene	Avg.	-	-	-	-	-	-
	Max.	0.15	0.0000031	0.0000063	0.0000814	0.0000156	0.000182
pH (Units)	Avg.	-	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0
	Max.	-	-	-	-	-	-

---

(1) Avg. represents the monthly average limitations. Max. represents maximum daily values.

(2) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

TABLE XII-2

NSPS ALTERNATIVES NO. 2,3 and 4 EFFLUENT LIMITATIONS GUIDELINES
COLD ROLLING

			NSPS Effluent Limitations (kg/kkg)*				
			Recirculation			Direct Application	
Discharge Flow (gal/ton)	(1)	Concentration Basis	Single Stand 5	Multi Stand 10	Combination 130	Single Stand 25	Multi Stand 290
Total Suspended Solids	Avg.	15	0.000313	0.000626	0.00814	0.00156	0.0181
	Max.	30	0.000626	0.00125	0.0163	0.00313	0.0363
Oil & Grease	Avg.	-	-	-	-	-	-
	Max.	10	0.000209	0.000417	0.00542	0.00104	0.0121
Chromium(2)	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Lead	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Nickel(2)	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Zinc	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Naphthalene	Avg.	-	-	-	-	-	-
	Max.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
Tetrachloroethylene	Avg.	-	-	-	-	-	-
	Max.	0.15	0.0000031	0.0000063	0.0000814	0.0000156	0.000182
pH (Units)	Avg.	-	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0
	Max.	-	-	-	-	-	-

---

(1) Avg. represents the monthly average limitations. Max. represents maximum daily values.

(2) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

* : Effluent limitations for NSPS Alternative No. 4 are zero kg/kkg since the alternative is a zero discharge system.

TABLE XII-3

DEMONSTRATION OF NSPS MODEL FLOW RATES

	Model Flow (gal/ton)	Number of Mills Achieving Flows	Percent of Total
Recirculation			
Single Stand	5	13	72.2
Multi Stand	10	12	50.0
Combination	130	5	38.5
Direct Application			
Single Stand	25	2	66.7
Multi Stand	290	7	41.2

Note: Refer to Tables IX-2 through IX-6 for a list of the individual mill flowrates.

TABLE XII-4

JUSTIFICATION OF NSPS
COLD ROLLING: RECIRCULATION

	Discharge Flow (gal/ton)	kg/kkg of Product								pH (Units)	C&TT Components
		TSS	Oil & Grease	Chromium	Lead	Nickel	Zinc	Naphthalene	Tetrachloroethylene		
1. Single Stand											
BPT	5	0.000626	0.000209	0.0000083	0.0000031	0.0000063	0.0000021	0.0000021	0.0000031	6.0 to 9.0	E,SS,NA,FLP,FLL, EB,VF,GF
Plant Visits											
* 321A (684D)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	SS, Filter
* 321B (684D)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	SS, Filter
* 321C (684D)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	SS, Filter
* 318 (856P)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	SS, Filter
2. Multi Stand											
BPT	25	0.00313	0.00104	0.0000417	0.0000156	0.0000313	0.0000104	0.0000104	0.0000156	6.0 to 9.0	E,SS,NA,FLP,FLL, EB,VF,GF
Plant Visits											
102 (384A 02603)	49	0.027	0.0075	<0.000006	<0.000010	<0.000005	0.000003	0.00	0.00	8.2	PSP,EB,CL
306 (248B-03)	3.5	0.00076	0.0019	0.000003	0.000002	0.000005	0.000005	**	0.00	5.8 to 6.8	Surge Tank, EB, OB,SB
* 308 (320)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	SB,SS,Filter
* 310 (432C)	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
X-2 (060B-03)	4.0	0.0015	0.00030	NA	NA	NA	NA	NA	NA	7.8	EB,GF,CL,SS
BB-2 (060-03)	16.0	0.00013	0.00040	NA	NA	NA	NA	NA	NA	7.7	DN,EB,T,FLP,FP, NL,CL,SL,SS,VF
EE-2 (112D-01)	17.4	0.00015	0.00029	NA	NA	NA	NA	NA	NA	7.8	CR,FLP,NL,NW,CL, SL,SS
684F-03	4.3	0.00026	0.00013	0.0000016	0.0000023	0.0000036	0.0000024	**	**	-	EB,GF,SS

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* These plants employ contract haulers to dispose of some or all of their oils and solutions.
** Value is less than 0.000001 kg/kkg.

NA: Not Analyzed

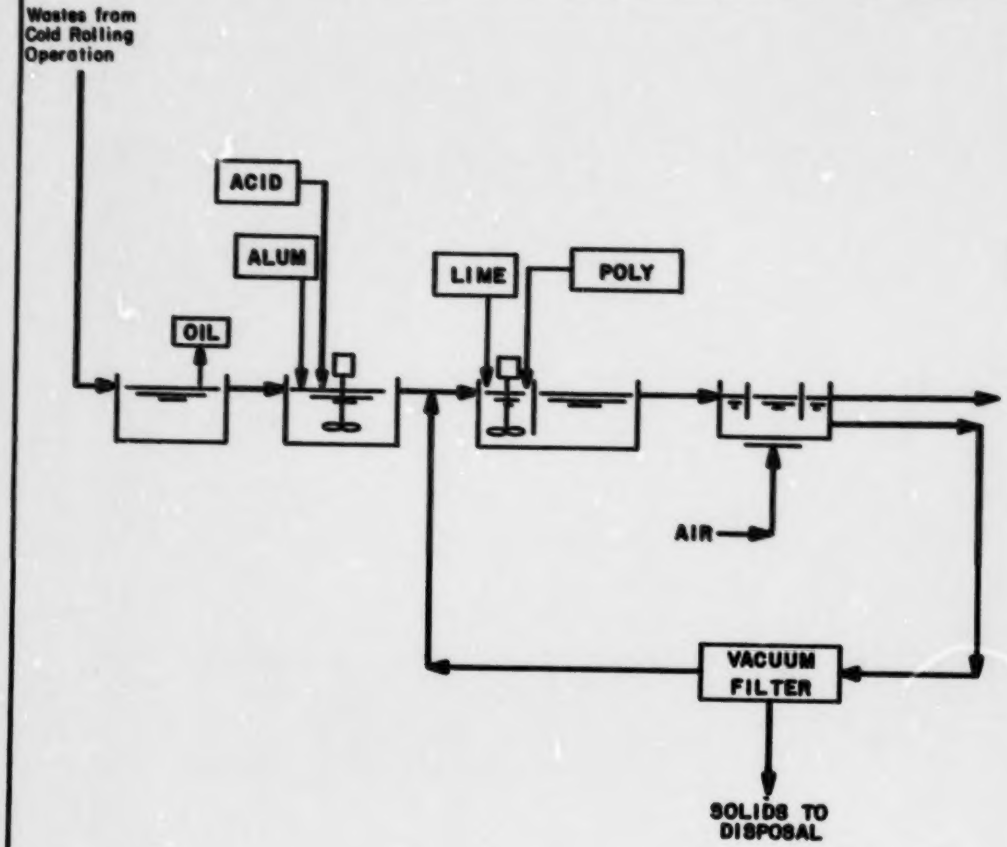
TABLE XII-5

JUSTIFICATION OF NSPS
COLD ROLLING: DIRECT APPLICATION

	Discharge Flow (gal/ton)	kg/kkg of Product									
		TSS	Oil & Grease	Chromium	Lead	Nickel	Zinc	Naphthalene	Tetrachloro-ethylene	pH (Units)	C&TT Components
1. Single Stand NSPS	25	0.00313	0.00104	0.0000417	0.0000313	0.0000313	0.0000104	0.0000104	0.0000156	6.0 to 9.0	E,SS,NA,FLP, FLL,EB,VF,FP,GF
Plant Visits											
106 (112B-01,03-06)	670	0.00039	0.0027	**	**	**	**	**	0.0	NA	E,SS,FSP,NW,T

**Value is less than 0.000001 kg/kkg.

NA: Not Analyzed


Wastes from Cold Rolling Operation
OIL
ACID
ALUM
LIME
POLY
AIR
VACUUM FILTER
SOLIDS TO DISPOSAL

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD ROLLING
NSPS MODEL
Dwn.7/9/80
FIGURE XII-1

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION XIII

PRETREATMENT STANDARDS FOR THE DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS

Introduction

This section presents pretreatment alternatives available for those cold rolling operations with discharges to publicly owned treatment works (POTWs). The Agency has given separate consideration to pretreatment of cold rolling wastewaters from new sources (PSNS) and from existing sources (PSES).

General Pretreatment Standards

For detailed information on Pretreatment Standards refer to 46 FR 9404 et seq., "General Ptetreatment Regulations for Existing and New Sources of Pollution," (January 28, 1981). See also 47 FR 4518 (February 1, 1982). In particular, 40 CFR Part 403 describes national standards (prohibited discharges and categorical standards), revision of categorical standards and POTW pretreatment programs.

In establishing pretreatment standards for cold rolling operations, the Agency considered the objectives and requirements of the General Pretreatment Regulations. The Agency determined that the discharge of untreated cold rolling wastewaters to POTWs would result in pass through of toxic pollutants.

Identification of Pretreatment Alternatives

Treatment Technologies

The pretreatment alternatives considered are identical to the BPT and the combined BPT and BAT alternative treatment systems discussed in Sections IX and X. These treatment systems are discussed in detail in those sections.

Flow Rates

The model flow rates used to develop the pretreatment standards for new sources (PSNS) are identical to the NSPS model flow rates. The development of these model flows is described in Section XII.

The model flow rates used in the PSES alternatives are equal to the model BPT flow rates. The development of these flows is described in Section IX.

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PSES/PSNS Alternative 1

This alternative consists of an equalization basin equipped with an oil skimmer, chemical addition steps to break the oil emulsions, a flocculation tank and an air flotation system. The standards achievable with this alternative are presented in Tables XIII-1 and XIII-3 for PSES and PSNS, respectively. The model flow and concentration bases are also presented in those tables.

PSES/PSNS Alternative 2

In this alternative, the effluent from Alternative 1 is further treated in mixed-media filters to further reduce the pollutant levels. The standards, model flow and concentration bases are presented in Tables XIII-2 and XII-4, for PSES and PSNS, respectively.

PSES/PSNS Alternative 3

In Alternative 3, the filtered effluent from Alternative 2 is further treated in granular activated carbon columns. The standards, model flows and concentration bases are presented in Tables XIII-2 and XIII-4, for PSES and PSNS, respectively.

PSES/PSNS Alternative 4

In this alternative, the effluent from Alternative 1 is processed by vapor compression distillation. The condensate is reused in the process. Thus, zero discharge is achieved.

Selection of Pretreatment Alternatives

PSES Alternative 1 and PSNS Alternative 1 (depicted in Figure XIII-1) were selected as the basis of the promulgated PSES and PSNS, respectively, for all cold rolling operations. The selected PSES and PSNS model treatment systems will prevent pass through of toxic pollutants at POTWs and are the same as the model BPT and BAT treatment systems. The removal rates of toxic metals from untreated cold rolling wastewaters for the selected PSES and PSNS are compared to the POTW removal rates for those metals. The average removal rate for the subcategory and the removal rate for recirculation mills are presented.

PSES/PSNS
Alternative 1

	Recirculation Mills	Average	POTW Removal
Chromium	90%	36%	65%
Lead	97%	68%	48%
Nickel	92%	38.7%	19%
Zinc	98%	67%	65%

As shown above, the selected pretreatment alternatives will prevent pass through of toxic metals at POTWs to a greater degree than would occur if cold rolling wastewaters were discharged untreated to POTWs.

The achievability of the PSES and PSNS is reviewed in Sections IX, X, and XII. The PSES and PSNS for cold rolling operations are presented in Tables XIII-1 and XIII-3 respectively.

TABLE XIII-1

PSES ALTERNATIVE NO. 1
EFFLUENT LIMITATIONS GUIDELINES
COLD FORMING SUBCATEGORY - COLD ROLLING

		Concentration (mg/l) All Cold Rolling	Effluent Limitations (kg/kkg)				
			Recirculation			Direct Application	
			Single Stand	Multi Stand	Combination	Single Stand	Multi Stand
Discharge Flow (gal/ton)	(1)		5	25	300	90	400
Chromium$^{(2)}$	Avg.	0.4	0.0000083	0.0000417	0.000501	0.000150	0.000668
	Max.	1.0	0.0000209	0.000104	0.00125	0.000375	0.00167
Lead	Avg.	0.15	0.0000031	0.0000156	0.000188	0.0000563	0.000250
	Max.	0.45	0.0000094	0.0000469	0.000563	0.000169	0.000751
Nickel$^{(2)}$	Avg.	0.3	0.0000063	0.0000313	0.000375	0.000113	0.000501
	Max.	0.9	0.0000188	0.0000939	0.00113	0.000338	0.00150
Zinc	Avg.	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max.	0.3	0.0000063	0.0000313	0.000375	0.000113	0.000501
Naphthalene	Avg.	-	-	-	-	-	-
	Max.	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
Tetrachloroethylene	Avg.	-	-	-	-	-	-
	Max.	0.15	0.0000031	0.0000156	0.000188	0.0000563	0.000250

---

(1) Avg. represents the monthly average limitations. Max. represents daily maximum values.

(2) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

TABLE XIII-2

PSES ALTERNATIVE NOS. 2, 3 & 4
EFFLUENT LIMITATIONS GUIDELINES
COLD ROLLING

			PSES Nos. 2 and 3 Effluent Limitations (kg/kkg)*				
			Recirculation			Direct Application	
		Concentration Basis	Single Stand	Multi Stand	Combination	Single Stand	Multi Stand
Discharge Flow (gal/ton)	(1)		5	25	300	90	400
Chromium(2)	Avg.	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max.	0.3	0.0000063	0.0000313	0.000376	0.000113	0.000501
Lead	Avg.	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max.	0.3	0.0000063	0.0000313	0.000376	0.000113	0.000501
Nickel(2)	Avg.	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max.	0.3	0.0000063	0.0000313	0.000376	0.000113	0.000501
Zinc	Avg.	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
	Max.	0.3	0.0000063	0.0000313	0.000376	0.000113	0.000501
Naphthalene	Avg.	-	-	-	-	-	-
	Max.	0.1	0.0000021	0.0000104	0.000125	0.0000375	0.000167
Tetrachloroethylene	Ave.	-	-	-	-	-	-
	Max.	0.15	0.0000031	0.0000156	0.000188	0.0000563	0.000250

---

(1) Avg. represents the monthly average limitations. Max. represents daily maximum values.

(2) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

* Effluent limitations for PSES Alternative No. 4 are zero kg/kkg since this alternative is a zero discharge system.

TABLE XIII-3

PSNS ALTERNATIVE NO. 1 EFFLUENT LIMITATIONS GUIDELINES
COLD ROLLING

		Concentration Rolling	PSNS Effluent Limitations (kg/kkg)				
			Recirculation			Direct Application	
			Single Stand	Multi Stand	Combination	Single Stand	Multi Stand
Discharge Flow (gal/ton)	(1)		5	10	130	25	290
Chromium$^{(2)}$	Avg.	0.4	0.0000083	0.0000167	0.000217	0.0000417	0.000484
	Max.	1.0	0.0000209	0.0000417	0.000542	0.000104	0.00121
Lead	Avg.	0.15	0.0000031	0.0000063	0.0000814	0.0000156	0.000182
	Max.	0.45	0.0000094	0.0000188	0.000244	0.0000469	0.000544
Nickel$^{(2)}$	Avg.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
	Max.	0.9	0.0000188	0.0000375	0.000488	0.0000939	0.00109
Zinc	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Naphthalene	Avg.	-	-	-	-	-	-
	Max.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
Tetrachloroethylene	Avg.	-	-	-	-	-	-
	Max.	0.15	0.0000031	0.0000063	0.0000814	0.0000156	0.000182
pH (Units)	Avg	-	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0
	Max	-	-	-	-	-	-

---

(1) Avg. represents the monthly average limitations. Max. represents daily maximum values.

(2) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

TABLE XIII-4

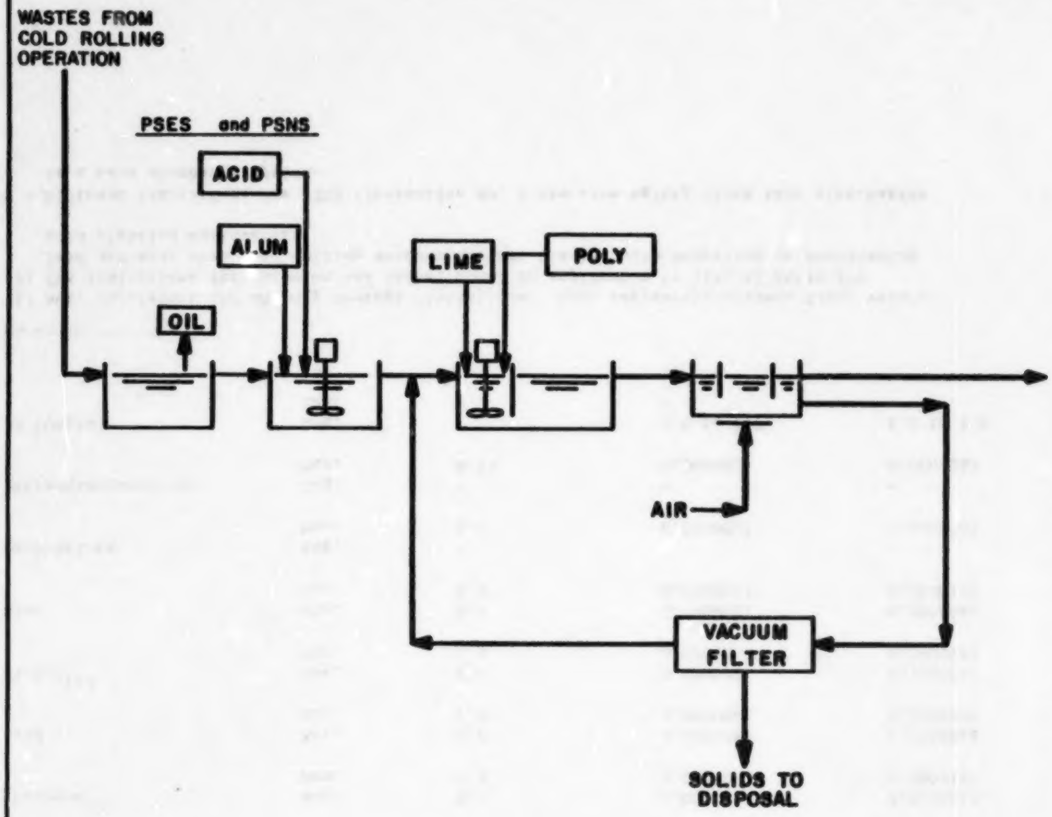
PSNS ALTERNATIVES NO. 2, 3 and 4 EFFLUENT LIMITATIONS GUIDELINES
COLD ROLLING

		Concentration Basis	PSNS Effluent Limitations (kg/kkg)*				
			Recirculation			Direct Application	
			Single Stand	Multi Stand	Combination	Single Stand	Multi Stand
Discharge Flow (gal/ton)	(1)		5	10	130	25	290
Chromium$^{(2)}$	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Lead	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Nickel$^{(2)}$	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Zinc	Avg.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
	Max.	0.3	0.0000063	0.0000125	0.000163	0.0000313	0.000363
Naphthalene	Avg.	-	-	-	-	-	-
	Max.	0.1	0.0000021	0.0000042	0.0000542	0.0000104	0.000121
Tetrachloroethylene	Avg.	-	-	-	-	-	-
	Max.	0.15	0.0000031	0.0000063	0.0000814	0.0000156	0.000182
pH (Units)	Avg.	-	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0
	Max.	-	-	-	-	-	-

---

(1) Avg. represents the monthly average limitations. Max. represents maximum daily values.
(2) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

* : Effluent limitations for PSNS Alternative No. 4 are zero kg/kkg since this alternative is a zero discharge system.


WASTES FROM
COLD ROLLING
OPERATION
PSES and PSNS
ACID
ALUM
OIL
LIME
POLY
AIR
VACUUM
FILTER
SOLIDS TO
DISPOSAL

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD ROLLING
PRETREATMENT MODEL
Dwn.7/9/80

FIGURE XIII-1

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION I

PREFACE

The USEPA has promulgated effluent limitations and standards for the iron and steel industry pursuant to Section 301, 304, 306, 307 and 501 of the Clean Water Act. The regulation contains effluent limitations for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS).

This part of the Development Document highlights the technical aspects of EPA's study of the Cold Worked Pipe and Tube Subdivision of the Cold Forming Subcategory of the Iron and Steel Industry. Volume I of the Development Document addresses general issues pertaining to the industry, while other volumes contain specific subcategory reports.

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COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION II

CONCLUSIONS

Based on this current study, a review of previous studies and comments received on the regulation proposed on January 7, 1981 (46 FR 1858), the Agency has reached the following conclusions with respect to the cold worked pipe and tube subdivision of the cold forming subcategory:

1. In the previous study, cold worked pipe and tube operations were part of the pipe and tube subcategory. However, data obtained as part of this study indicate that cold worked pipe and tube operations are different than hot forming pipe and tube operations, and that it is more appropriate to include the cold pipe and tube operations in a separate subdivision in the cold forming subcategory.

2. The cold worked pipe and tube subdivision is segmented into those operations using water and those using soluble oil solutions. Differences in wastewater characteristics, wastewater treatability, and process water usage are the basis for this division.

3. For those operations using water, the Agency has promulgated a zero discharge limitation. The Agency has also established a zero discharge limitation for those plants using soluble oil solutions. These plants recycle most of the solutions with a small amount, 0.5 gal/ton, disposed of by contract hauling. Incineration of the spent solution is an alternate method of disposal.

4. The Agency has promulgated BCT and BAT effluent limitations and PSES and PSNS equal to the BPT limitations. Data obtained for cold worked pipe and tube operations demonstrate that toxic metal pollutants are in wastewaters from both types of operations and toxic organic pollutants are found only at those operations using oil.

5. The Agency estimates that industry will incur the following costs in complying with the cold worked pipe and tube limitations. The Agency has determined that the effluent reduction benefits associated with compliance with the effluent limitations and standards justify the costs presented below:

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Costs (Millions of July 1, 1978 Dollars)

	Investment Costs		Annual Costs	
	In-Place	Required	In-Place	Required
Using Water				
BPT	3.30	0.76	0.43	0.10
Using Soluble Oil Solutions				
BPT	3.06	0.02	0.40	0.00
TOTAL	6.36	0.78	0.83	0.10

The Agency has also determined that the effluent reduction benefits associated with compliance with new source standards (NSPS, PSNS) justify those costs.

6. The Agency estimates that compliance with the BPT limitations for cold worked pipe and tube operations will result in significant removals of conventional and toxic pollutants. A summary of the removals occurring as a result of the BPT limitations follows:

	Process Flow (MGD)	Direct Dischargers Effluent Loadings (Tons/Year) Toxic Organics	Toxic Metals	Conventional Pollutants
Using Water				
Raw Waste	19.2	0	6.8	1,878
BPT	0	0	0	0
Using Soluble Oil Solutions				
Raw Waste	24.5	20.4	220	2,681,185
BPT	0	0	0	0

7. The NSPS and PSNS for both types of cold worked pipe and tube plants are identical to the corresponding BPT limitations.

8. The Agency has promulgated PSES equal to the BPT limitations for cold worked pipe and tube operations using water and oil. It estimates that compliance with PSES will result in removal of conventional and toxic pollutants. A summary of the removals as a result of PSES follows:

	Process Flow (MGD)	Toxic Organics	Toxic Metals	Conventional Pollutants
	Indirect Dischargers Effluent Loadings (Tons/Year)			
Using Water				
Raw Waste	3.0	0	1.0	289
PSES	0	0	0	0

Using Soluble Oil Solutions

No operations discharge to POTWs.

9. The remand issues that are directly applicable to the cold worked pipe and tube subdivision are discussed in detail in this report. A summary of these issues follows:

   a. The remand required examination of the degree of water consumption that would result from the installation of the treatment systems. Since the alternative treatment systems considered for cold worked pipe and tube operations do not include recycle or cooling systems, no impact is expected on water consumption as a result of the application of the promulgated effluent limitations.

   b. The Agency evaluated the adequacy of its cost estimates with regard to site-specific factors. As discussed in greater detail in Volume I, the Agency concluded that its cost models are adequate to account for site-specific factors.

   c. Neither relaxed effluent limitations nor alternate effluent limitations based upon retrofit costs are necessary for older cold worked pipe and tube operations. Analysis indicates that the age of cold worked pipe and tube operations has no significant effect upon the ease or cost of retrofitting pollution control equipment.

10. Table II-1 presents the limitations and standards corresponding to the BPT, BAT, BCT, NSPS, PSES, and PSNS treatment levels for cold worked pipe and tube operations using water and soluble oil solutions.

TABLE II-1

EFFLUENT LIMITATIONS AND STANDARDS
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE

Treatment Level	Effluent Limitations and Standards
Operations Using Water	
BPT	No discharge of process wastewater pollutants to navigable waters.
BAT	
BCT	
NSPS	
PSES	No discharge of process wastewater pollutants to publicly owned treatment works.
PSNS	
Operations Using Soluble Oil Solutions	
BPT	No discharge of process wastewater pollutants to navigable waters.
BAT	
BCT	
NSPS	
PSES	No discharge of process wastewater pollutants to publicly owned treatment works.
PSNS	

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION III

INTRODUCTION

General Discussion

In cold worked pipe and tube operations, hot formed seamless pipe at ambient temperature is expanded or drawn into tubes, and cold flat steel strip (skelp) is formed into hollow cylindrical products followed by electrical or fusion welding of the seam. During this operation, contact cooling water or soluble oil solutions are continuously flushed over the pipe and tube products for cooling and lubrication. These water and oil solutions are the regulated wastewaters from cold worked pipe and tube operations.

In 1976, the Agency sent basic questionnaires (DCPs) to approximately 85% of the cold worked pipe and tube mills in the United States. Responses to the DCPs for one hundered twenty-six cold worked pipe and tube mills provided information regarding applied and discharge flow rates, wastewater treatment systems installed, mill capacities, and modes of operation. The data contained in the DCPs have been tabulated and summarized in Tables III-1 and III-2.

Detailed data collection portfolios (D-DCPs) were sent to selected pipe and tube mills to gather information on treatment costs, and on the pipe and tube mill process. Responses were received for five pipe and tube mills using oil. Tables III-3 and III-4 summarize the data base for this report as derived from these sources of information.

Pipe and tube operations are no longer treated as a separate subcategory. Hot worked pipe and tube operations are included in the hot forming subcategory, while cold worked pipe and tube operations are included in the cold forming subcategory. Cold worked pipe and tube operations are further segmented based upon whether water or oil is used as the lubricant.

Description of Pipe and Tube Mills

Cold Expanded Pipe

The properties of hot rolled seamless pipe can be improved by cold working the product. Cold working the pipe increases its yield strength and generally improves the product. One method of cold working is the seamless pipe method in which the hot rolled pipe (after cooling) is conveyed to a cold expander mill. The hot rolled pipe is dropped into an expander trough and clamped with one end held firmly against a backstop. A long ram is positioned at the opposite end of the pipe, and an expander plug is forced through the pipe using extreme pressure. The plug is lubricated through the ram head with a water soluble oil. After cold expansion, the seamless pipe enters a rotary straightener and then is hydrostatically tested.

Cold Drawn Tube

While most quality requirements for seamless pipe and tubing products can be met by the hot rolling processes, some pipe and tube specifications require closer tolerance, enhanced physical and surface properties, thinner walls, and smaller diameters than can be produced by hot worked methods. These specifications can be met by cold drawing the hot rolled tubes in a finishing operation.

The process consists of pulling a cold tube through a die, with a smaller opening than the outside diameter of the tube being drawn. The hot rolled tubes are crimped and pointed on the leading end, so that the pipe section can pass through the die and permit the jaws of the puller mechanism to grip the end of the tube. The inside surface of the tube is supported by a mandrel anchored on the end of a rod, so that the mandrel remains in the plane of the die during the drawing operation. Another method involves using an internal bar rather than a stationary mandrel. This bar travels along with the tube, as it is drawn through the die. Tubes of certain grades are annealed prior to the cold drawing operation. All tubes are pickled to remove scale and oxides, rinsed, and then dipped into a lubricant tub (flour, tallow and water, or a special oil emulsion for a bright finish) prior to the cold drawing operation.

Other cold tube reducing methods, such as the "Rockrite" process, are also used for cold drawing. The "Rockrite" process accomplishes simultaneous reduction of tube diameter and wall thickness by a cold swaging action, which uses compressive forces rather than tensile forces, as used in conventional cold drawing. Two semi-circular dies have matched, tapered, semi-circular grooves machined into their curved faces. In operation, one die is placed on top of the other, so that the matched semi-circular grooves make a circular pass. The dies are geared to each other in such a manner that they rotate in opposite directions when they are moved laterally, and a converging circular pass is traced by the die grooves. When a tube is held stationary on the centerline of this pass, the converging path of the die grooves reduces its diameter. If a stationary mandrel of the proper taper is also positioned in the center line of the pass, the inside of the tube is supported between the die and mandrel. When in operation, the dies are in constant lateral and rotary reciprocal motion. Coolant solutions are constantly poured onto the dies.

Electric Resistance Welded Tubing

Electric resistance welded tubing is referred to as ERW tubing. Strip, sheet, or plate in coil form is used as a starting material for the ERW process. The steps used in the manufacture of ERW tubing are: forming, welding, sizing, cutting, and finishing.

The width of the strip is determined by the circumference of the tubing to be welded. If extra wide strip is used, it is passed through a slitting-line for cutting to proper width and then recoiled. The proper width strip is fed into forming rolls. The forming rolls consist of an edge trimmer (to smooth and clean the edge of the strip for welding and forming), closing, and fin pass rolls. After the fin rolls, the strip enters the welding section where the tube is held in pressurized squeeze rolls, as the edges are heated to welding temperature. The heat for welding is provided by low-frequency power through electrode wheels, by radio-frequency power through sliding contacts, or by coil induction. Typical power for welding is supplied at 450,000 cycles per second. The welded tube then passes under a cutting tool, which removes the flash resulting from the pressure during welding. The welded seam or entire tube is then annealed or normalized, depending on the required metallurgy. After cooling, the tube is sized on horizontal and vertical sizing rolls to obtain a round finished product of the desired diameter. After sizing, the tube is cut to length and straightened and end-finished if required. The tubes are then inspected and packed for shipment.

Electric Welded Pipe

The electric weld process or fusion weld is used to produce pipe in various diameters. If the desired pipe circumference exceeds the plate width, two or more plates may be welded together to provide the necessary width. The steps required to make plates into pipe by the electric weld process are shearing, planing, crimping, bending, welding, expanding, and finishing.

Plate is transferred to the edge-planing machine, where it is aligned so that the two edges will be parallel and square with the ends after planing. Forming plate into circular pipe is usually performed in three operations called crimping, "U"-ing, and "O"-ing. The first operation, crimping, consists of bending the edges in a press, so as to avoid a flat surface near the longitudinal seam of the pipe. The crimped plate is then conveyed to a "U"-ing machine. In this operation, the plate is centered over a series of parallel rocker-type dies, which lie along the axis of the plate. A large "U"-shaped die operated by a press, as long as the longest length of plate, is moved down on the plate, forcing it between the dies which automatically conform themselves to the operations and assist in forming the plate into the "U"-shape. The plate is then transferred to what is called the "O"-ing machine. The machine consists of two semi-circular dies, which are as long as the plate. Rollers mounted on vertical spindles prevent the plate from falling and keep it in correct alignment as it enters the "O"-ing machine. The "U"-shaped plate rests in the bottom die, and the top die is forced down by a press, deforming the plate until it is the shape of an almost closed circle, which is then ready for welding. The pipe is held in position for welding by a longitudinal rod, which maintains the proper gap for welding. A specially designed welding head deposits flux along the joint, feeds the metal electrode, and transmits welding current to the joint and electrode. Molten filler metal is deposited from the metal electrode to the work and replaces the fluid flux and forms the weld. After the pipe is welded on the outside, it is then welded on the inside by an automatic welding machine mounted on the end of a long cantilever arm. The pipe is drawn over this arm by a carriage. After welding, the scaly deposit left from the flux is removed by a cantilevered tube device.

The final pipe diameter is obtained by either hydraulically expanding the shell against a retaining jacket or mechanically expanding it over an inside mandrel. In hydraulic expansion, the ends are expanded to the proper diameter by mandrels. Retainer rings encircle the body of the pipe, which is filled with water and hydraulically expanded to the limits of the bands. This also serves as a hydraulic test. The expansion, by either method, sizes, rounds, and straightens the pipe and provides a good test of the weld. Attention is given to nondestructive inspection of the weld by X-ray examination. The pipe is then placed in special machines which face the ends, to ensure that they are smooth and at right angles. If the joints are to be welded, the ends are beveled in this operation prior to shipment.

More specific details of a typical ERW operation are presented in Figure III-1.

TABLE III-1

GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton) Applied	Flows (gallons/ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0060P 01	Welded Pipe	SS 100	1968	0.3	1920	0	None	CNT2(Unk), O1	OT	Zero Discharge
0060P 02	Welded Tube and Pipe	SS 100	1968	0.6	960	0	None	CNT2(Unk), O1	OT	Zero Discharge
0060P 03	Welded Tube and Pipe	SS 100	1968	0.9	640	0	None	CNT2(Unk), O1	OT	Zero Discharge
0060P 04	Welded Pipe	SS 100	1968	0.3	1920	0	None	CNT2(Unk), O1	OT	Zero Discharge
0060P 05	Welded Tube	SS 100	1968	1.8	320	0	None	CNT2(Unk), O1	OT	Zero Discharge
0060P 06	Welded Tube and Pipe	SS 100	1968	0.6	960	0	None	CNT2(Unk), O1	OT	Zero Discharge
0060P 07	Welded Tube	SS 100	1969	0.9	640	0	None	CNT2(Unk), O1	OT	Zero Discharge
0060P 08	Welded Tube	SS 100	1976	1.5	384	0	None	CNT2(Unk), O1	OT	Zero Discharge
0060P 09	Welded Pipe	SS 100	1976	0.3	1920	0	None	CNT2(Unk), O1	OT	Zero Discharge
0112A 03	Welded Pipe	CS 100	1957	858	Unk	Unk	None	CNT2(Unk), SS, Scr, ML,AE,FLA, FLP,SL(Unk), CY,T	OT	Direct

TABLE III-1
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)
PAGE 2

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton)		Treatment Components		Operating Mode	Discharge Mode
					Applied	Discharge	Process Treatment	Central Treatment		
0112E	Welded Pipe	CS 45 HSLA 55	1962	1134	Unk	Unk	PSP	None	RET 100	Indirect
0176C	Welded Tube (01-19 mills)	SS 100	1947	22.8 Total for 19 mills	1990	Unk	-	CNT1(Unk), CT	RTP(Unk) RET(Unk) BD(Unk)	POTW
(+)0176D	Welded Tube (01-04 mills)	SS 100	1972	9 Total for 4 mills	2880	Unk	-	CNT1(Unk), CT	RTP(Unk) RET(Unk) BD(Unk)	POTW
0256F	Welded Tube (04-06 mills)	SS 100	1968	4.5 Total for 3 mills	Unk	0	SS	None	RTP 100	Zero Discharge
0492A 01	Welded Tube	CS 100	1953	1011.4	22,211	17,731	PSP,SS	CNT2 20.2, SL(Unk)	RTP 20.2 RET 79.8	Recirc. Reservoir
0492A 02	Welded Tube	CS 100	1953	669.2	33,784	26,926	PSP,SS	CNT2 20.3, SL(Unk)	RTP 20.3 RET 79.7	Recirc. Reservoir
0492A 03	Welded Pipe	CS 100	1962	246	2049	2039	None	CNT2 0.5, SL(Unk)	RTP 0.5 RET 99.5	Recirc. Reservoir
0492A 04	Cold Drawn Tube	CS 100	1970	339	1920	1910	None	CNT2 0.5, SL(Unk)	RTP 0.5 RET 99.5	Recirc. Reservoir
0584H	Welded Tube and Pipe	CS 100	1976	246	51,483	3512	-	CNT2 92.3 PSP,SS, SSP,CT, NW	Losses 1.2 BD 6.4 RTP 92.4	POTW - 0.1 Direct-6.4

TABLE III-1
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)
PAGE 3

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton)		Treatment Components		Operating Mode	Discharge Mode
					Applied	Discharge	Process Treatment	Central Treatment		
0856Q 03	Welded Tube	CS 70 HSLA 30	1950	1155	Unk	Unk	PSP	CNT2(Unk), SL(Unk), SS	OT	Direct
0864A	Welded Tube, Submerged Arc Welded Pipe, Elec. Resistance Welded Pipe	CS 68 HSLA 32	1955	489	589	589	PSP	CNT2 1.2, SL(Unk), SS	OT	Direct
0868B	Double Submerged Arc - Welded Pipe	CS 25 HSLA 75	1978	Not Yet In Operation		-	-	CNT2 0.7, F(Unk) (Unk)P, SS,SL(Unk)	OT	Direct
0884C	Seamless Pipe and Tube Cold Drawn and Welded Tube	CS 90 HSLA 10	1961	21	720	720	-	None	OT	Direct
0884K	Cold Drawn and Welded Tube	SS 100	1968	13.5	Unk	Unk	None	CNT2 (Unk), ML	OT	POTW
0908	Welded Tube	CS 100	1976	156	Unk	0	CT	None	RTP 100	Zero Discharge
0908A 01	Welded Tube	CS 100	1971	327	Unk	0	CT	None	RTP 100	Zero Discharge

TABLE III-1
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)
PAGE 4

Plant Code	Product	Type of Steel	Mill Age	Mill size (Tons/Day)	Flows (gallons/ton)		Treatment Components		Operating Mode	Discharge Mode
					Applied	Discharge	Process Treatment	Central Treatment		
0908A02	Welded Tube	CS 100	1971	285	Unk	0	CT	None	RTP 100	Zero Discharge
0948B	Welded Tube	CS 100	1930	(2)	NA	NA	PSP	None	-	Direct

-: There is insufficient data to determine if such systems exist.
*: Confidential information.
(+): Plant/line has been shutdown.

None: The available data imply that no such systems exist.
Unk : The magnitude of the stream was not calculable from the available data.
NA : Not applicable.

CS# : % Carbon Steel
HSLA#: % High Strength Low Alloy Steel
SS# : % Stainless Steel

NOTE: Refer to Table VII-1 for definitions of the abbreviations used in this table.

[ ]: Bracketed data are derived from D-DCP or plant visit report.
( ): Parenthesis designates those treatments installed since 1/1/78.
(1): Evaporation and percolation pond.
(2): This plant was idle during the period 1974-1976.

TABLE III-2

GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Oil Solution Flows (gallons/ton) Applied	Oil Solution Flows (gallons/ton) Discharged	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0060	Welded Tube (01-08 mills)	CS 100	01-07 1963 08 1974	196 Total for 8 mills	3673	Unk(1)	None	CNT1(100), FSP,SSP FFOP	RTP(Unk)	Oil solutions are hauled
0080A 01	Welded Tube	CS 100	1954	21.8	Unk	Unk(1)	-	CNT1(Unk), CT	RUP(Unk)	Oil solutions are hauled
0080A 02	Welded Tube	CS 100	1954	21.8	Unk	Unk(1)	-	CNT1(Unk), CT	RUP(Unk)	Oil solutions are hauled
0080A 03	Welded Tube	CS 100	1954	21.8	Unk	Unk(1)	-	CNT1(Unk), CT	RUP(Unk)	Oil solutions are hauled
0240B 01	Welded Tube	CS 100	1937	20.7	3478	1.13 (1) Total for 2 mills	FFOP	-	RTP 99	Oil solutions are hauled
0240B 02	Welded Tube	CS 100	1946	12	6000					
0240B 03	Welded Tube	CS 100	1961	99	Unk	[0.90](1)	[-]	-	[RUP(Unk)]	Oil solutions are hauled
0240B 04	Welded Tube	CS 100	1961	141	Unk	0.22(1)	FFOP	-	RTP(Unk)	Oil solutions are hauled
✓0240B 05	[Welded Tube]	[CS100]	[NA]	[350.8]	[Unk]	[0.18](1)	[-]	[-]	[RUP(Unk)]	[Oil solutions are hauled]
0240C 01	Welded Tube	CS 100	1955	39.3	Unk	Unk(1)	None	None	RUP(Unk)	Oil solutions are hauled

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 2

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Oil Solution Flows (gallons/ton)		Treatment Components		Operating Mode	Discharge Mode
					Applied	Discharged	Process Treatment	Central Treatment		
0240C 02	Welded Tube	CS 97 HSLA 3	1963	122.7	Unk	Unk$^{(1)}$	None	None	RUP(Unk)	Oil solutions are hauled
0240C 03	Welded Tube	CS 95 HSLA 5	1969	217.8	Unk	Unk$^{(1)}$	None	None	RUP(Unk)	Oil solutions are hauled
0240C 04	Cold Drawn Tube	CS 100	1974	102	Unk	Unk$^{(1)}$	[PSP,CT]	None	RUP(Unk)	Oil solutions are hauled
0256F	Welded Tube (01-03 mills)	CS 99.5 HSLA 0.5	1953	189 Total for 3 mills	1143	0	[-]	[CNT1(100) CT]	RTP 100	Zero discharge
0432A 05	Welded Tube	CS 80 HSLA 20	1957	444	Unk	Unk$^{(1)}$	-	None	RUP(Unk)	Oil solutions are hauled
0548A 03	Welded Tube	CS 100	1970	*	*	*	*	*	*	*
0548C 01-03	Welded Tube	CS Unk SS Unk	01-02 1966 03 1975	Unk	Unk	[3.75]$^{(1)}$	-	[CNT1(100) CY,FFOP]	RTP(Unk)	Oil solutions are hauled
0636 01	Welded Tube	CS 100	1963	Unk	Unk	Unk$^{(1)}$	-	-	RUP(Unk)	Oil solutions are hauled
0636 02	Welded Tube	CS 100	1963	Unk	Unk	Unk$^{(1)}$	-	-	RUP(Unk)	Oil solutions are hauled
0636 03	Welded Tube	SS 100	1960	Unk	Unk	Unk$^{(1)}$	-	-	RUP(Unk)	Oil solutions are hauled

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 3

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Oil Solution Flows (gallons/ton) Applied	Oil Solution Flows (gallons/ton) Discharged	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0636 04	Welded Tube	SS 100	1975	Unk	Unk	Unk(1)	-	-	RUP(Unk)	Oil solutions are hauled
0684A 01	Welded Tube	[CS 100]	1963	1050	[1956]	[97.8]	[PSP]	-	[RTP 95.0 BD 5.0]	Direct
0684K 01	Welded Tube	*	1957	*	*	*	-	CNT1(Unk) PSP,SS	RTP(Unk)	Oil solutions are hauled
0684K 02	Welded Tube	*	1960	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 03	Welded Tube	*	1941	*	*	*	-	CNT1(Unk) PSP,SS	RTP(Unk)	Oil solutions are hauled
0684K 04	Welded Tube	*	1937	*	*	*	PSP,SS	None	RTP(Unk)	Oil solutions are hauled
0684K 05	Welded Tube	*	1930	*	*	*	-	CNT1(Unk) PSP,SS	RTP(Unk)	Oil solutions are hauled
0684K 06	Welded Tube	*	1938	*	*	*	-	CNT1(Unk) PSP,SS	RTP(Unk)	Oil solutions are hauled
0684K 07	Welded Tube	*	1938	*	*	*	-	CNT1(Unk) PSP,SS	RTP(Unk)	Oil solutions are hauled
0684K 08	Welded Tube	*	1968	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 09	Welded Tube	*	Unk	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 10	Welded Tube	*	1960	*	*	*	PSP	None	RTP *	Oil solutions are hauled

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 4

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Oil Solution Flows (gallons/ton) Applied	Oil Solution Flows (gallons/ton) Discharged	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0684K 11	Welded Tube	*	1944	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 12	Welded Tube	*	1947	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 13	Welded Tube	*	1952	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 14	Welded Tube	*	1966	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 15	Welded Tube	*	1972	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 16	Welded Tube	No Information Reported								
0684L 01	Welded Tube	*	1967	*	Unk	0.43	[FFOP,PSP]	None	RTP(Unk)	Oil solutions are hauled
0684L 02	Welded Tube	*	1975	*			[FFOP,PSP]	None	RTP(Unk)	Oil solutions are hauled
0684L 03	Welded Tube	*	1975	*			[FFOP,PSP]	None	RTP(Unk)	Oil solutions are hauled
0684L 04	Welded Tube	*	1976	*			[FFOP,PSP]	None	RTP(Unk)	Oil solutions are hauled
0684M 01	Welded Tube	*	1934	*	*	*	None	CNTl * PSP, Cooler	RTP * RET *	Oil solutions are hauled
0684M 02	Welded Tube	*	1929	*	*	*	None	CNTl * PSP, Cooler	RTP * RET *	Oil solutions are hauled

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 5

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Oil Solution Flows (gallons/ton) Applied	Oil Solution Flows (gallons/ton) Discharged	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0684M 03	Welded Tube	*	1959	*	*	*	None	CNT 1 * PSP, Cooler	RTP * RET *	Oil Solutions are hauled
0684M 04	Welded Tube	*	1959	*	*	*	None	CNT 1 * PSP, Cooler	RTP * RET *	Oil Solutions are hauled
0684M 05	Welded Tube	*	1959	*	*	*	None	CNT1 * PSP, Cooler	RTP * RET *	Oil solutions are hauled
0684M 06	Welded Tube	*	1965	*	*	*	None	CNT1 * PSP, Cooler	RTP * RET *	Oil solutions are hauled
0684N 01	Welded Tube	*	1925	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 02	Welded Tube	*	1925	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 03	Welded Tube	*	1925	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 04	Welded Tube	*	1965	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684N 05	Welded Tube	*	1942	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 06	Welded Tube	*	1946	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 07	Welded Tube	*	1959	*	*	*	Cooler	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 08	Welded Tube	*	1943	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
06840	Welded Pipe	*	1968	*	*	*	PSP,SS	None	RTP *	Direct (Ground Evaporation)

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 6

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Oil Solution Flows (gallons/ton) Applied	Oil Solution Flows (gallons/ton) Discharged	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0684W 01	Welded Tube	*	1969	*	*	*	PSP,Cooler	None	RTP *	Oil solutions are hauled
0684W 02	Welded Tube	*	1969	*	*	*	PSP,Cooler	None	RTP *	Oil solutions are hauled
0856N 05	Welded Pipe	CS 100	1965	435	[1929]	[0]	[CT]	[-]	[RTP(100)]	[Zero Discharge]
0856Q 04	Welded Tube	CS 30 HSLA 70	1963	1107	Unk	Unk$^{(1)}$	PSP	None	[RTP (Unk)]	Oil solutions are hauled
0916A 02	Welded Tube	CS 100	1954	72	Unk	Unk$^{(1)}$	None	None	RUP (Unk)	Oil solutions are hauled

---

[ ]: Bracketed data are derived from D-DCP or plant visit report.
- : There is insufficient data to determine if such systems exist.
* : Confidential information.
✓ : No DCP was received for this mill. The information listed is the result of a sampling visit.
(): Parenthesis designate treatment installed since 1/1/78.

CS# : % Carbon Steel
HSLA#: % High Strength Low Alloy Steel
SS# : % Stainless Steel

None: The available data imply that no such systems exist.
Unk : The magnitude of the stream was not calculable from the available data.

NOTE: Refer to Table VII-1 for definitions of the abbreviations used in this table.

(1): Number represents GPT discharge to contract hauler. Contract hauling is a means of obtaining zero discharge to navigable waters.

TABLE III-3

DATA BASE
COLD FORMING SUBCATEGORY
COLD WORKED-PIPE AND TUBE
(USING WATER)

	Number of Mills	Percent of Total Number of Mills	Daily Capacity of Mills (Tons)	Percent of Total Daily Capacity
Operations sampled for Original Guidelines Study	0(1)	0	0	0
Operations sampled for this study	2	3.1	1159.5	14.1
Operations which responded to detailed DCP's	0	0	0	0
Operations sampled and/or surveyed via detailed DCP's	2	3.1	1159.5	14.1
Operations responding to DCP's	54(2)	~85.0	6993.6	~85.0
Estimated number of operations	64	100.0	8227.8	100.0

---

(1) One pipe and tube mill using water was sampled during the original study. The data from this plant were determined to be nonrepresentative. Since recent visits were made, only the newer data were used for the updated data base.

(2) This total includes three mills which are dry operations.

TABLE III-4

DATA BASE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)

	Number of Mills	Percent of Total Number of Mills	Daily Capacity of Mills (Tons)	Percent of Total Daily Capacity
Operations sampled for Original Guidelines Study	0	0	0	0
Operations sampled for this study	8	9.4	3386.5	49.9
Operations which responded to detailed DCP's	5 incl. 3 above	5.9 incl. 3.5 above	834.5 incl. 638.8 above	12.3 incl. 9.4 above
Operations sampled and/or surveyed via detailed DCP's	10	11.8	3582.5	52.8
Operations responding to DCP's	72(1)	~85.0	5765.6	~85.0
Estimated number of operations	85	100.0	6783.0	100.0

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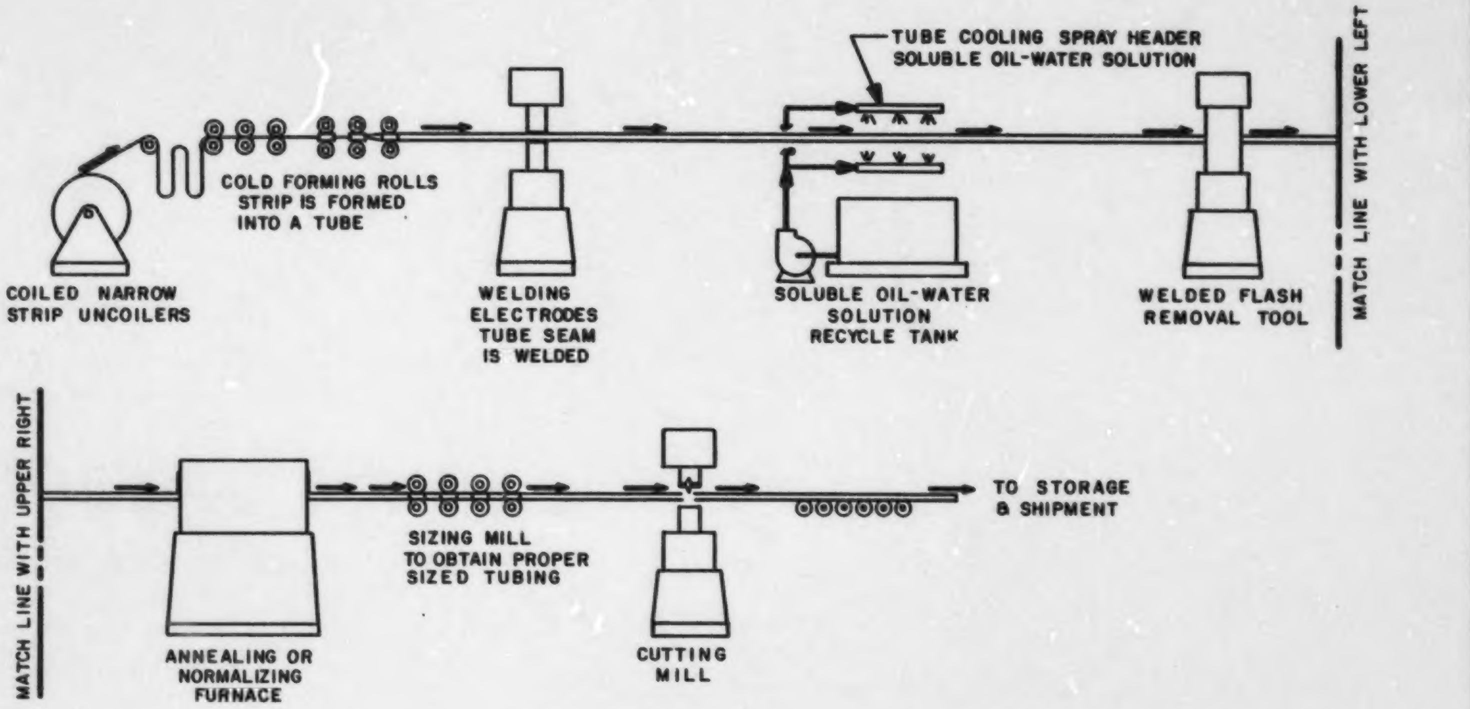
(1) This total includes eight mills for which production data were not provided.


TUBE COOLING SPRAY HEADER
SOLUBLE OIL-WATER SOLUTION
COLD FORMING ROLLS
STRIP IS FORMED
INTO A TUBE
COILED NARROW
STRIP UNCOILERS
WELDING
ELECTRODES
TUBE SEAM
IS WELDED
SOLUBLE OIL-WATER
SOLUTION
RECYCLE TANK
WELDED FLASH
REMOVAL TOOL
MATCH LINE WITH LOWER LEFT
MATCH LINE WITH UPPER RIGHT
TO STORAGE
& SHIPMENT
SIZING MILL
TO OBTAIN PROPER
SIZED TUBING
ANNEALING OR
NORMALIZING
FURNACE
CUTTING
MILL

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD WORKING TUBING MILL
ELECTRIC RESISTANCE WELDED
PROCESS FLOW DIAGRAM

Dwn. 3/14/79

FIGURE III-1

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION IV

SUBCATEGORIZATION

Introduction

Originally, cold worked pipe and tube operations were included in the pipe and tube subcategory. Based upon data obtained since the promulgation of the previous regulation, the Agency has found significant differences between the hot worked and cold worked pipe and tube subdivisions. Accordingly, cold worked pipe and tube operations now constitute a subdivision of the cold forming subcategory. The cold forming subcategory also includes cold rolling operations. As the Agency found variations in the final products and manufacturing processes between the cold forming operations, the subcategory was subdivided into the cold rolling and cold worked pipe and tube subdivisions.

The Agency also believes that within the cold worked pipe and tube subdivision, further segmentation is appropriate based upon the type of process solution used (see discussion below). The Agency examined other factors, including raw materials, size and age, and geographic location, but found that they have no significant effect on further segmentation. Each of these factors is discussed in greater detail below.

Manufacturing Process and Equipment

Cold working operations manufacture cold drawn or welded pipe and tube from cold semi-finished products, strip, or skelp. Several processes are employed to manufacture these products. Electric resistance welding, fusion welding, and cold drawing are all cold working operations which encompass similar equipment and processes. Therefore, the Agency believes that no further division or segmentation is appropriate on this basis.

Final Products

Products of various dimensions can be manufactured in cold worked pipe and tube mills. Different types of equipment are used in the manufacture of these products. Some processes use water solutions for lubrication and cooling purposes; others use soluble oil solutions. Although the quality and quantity of waste solutions may vary, the Agency did not find any correlation between the products manufactured and the waste solutions generated.

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Raw Materials

The raw materials used in cold worked pipe and tube operations include steels of various material specifications. The differences in the steels processed have no significant effect on the wastewater characteristics. The raw materials used in the manufacture of a finished product have little bearing upon the subdivision or segmentation of cold worked pipe and tube operations.

Wastewater Characteristics

A review of the DCP data indicates the need for further segmentation based upon the process wastewaters generated in the cold worked subdivision. The plant survey data indicates that soluble oil solutions are used in some cold working mills for process requirements, while only water is used at the remaining cold working mills. On this basis, the segmentation of the cold working process was made.

Wastewater Treatability

As indicated above, the treatability of cold worked pipe and tube wastewaters differs between mills using water and mills using soluble oil solutions. There are substantial differences in the characteristics of these wastewaters and thus different treatment technologies would apply. The wastewaters from those mills using oils consist of soluble oil solutions, whereas the wastewaters from mills using water consists of water contaminated with tramp oils and particulate matter. Soluble oil solutions are effectively treated by dissolved gas floatation whereas waters contaminated with tramp oils and particalate matter are effectively treated by gravity separation. The cold worked subdivision is segmented to recogonize this difference.

Size and Age

The Agency considered the impact of size and age on the segmentation of cold worked pipe and tube mills. Size has no apparent effect upon segmentation. Analysis failed to reveal any correlation between the size of a pipe and tube mill and process water usage. Shown on Figure IV-1 is a plot of discharge flow (in gallons/ton)versus size (expressed as capacity in tons/day) for cold worked pipe and tube mills using water. (No figure is provided for cold working mills using soluble oil solutions, as 90% of these mills currently achieve zero discharge which is the BPT requirement.) As can be seen by the plot, the size of a pipe and tube mill has no bearing upon the ability to recycle and subsequently eliminate the discharge. Thus, the Agency concluded that further segmentation based upon the size of cold worked pipe and tube mills is not appropriate.

The Agency next examined age as a possible basis for further segmentation. According to DCP data, the oldest mill now in operation was built in 1925, and the newest was built in 1978. The Agency compared discharge flow versus age in a manner similar to the discharge flow versus size comparison noted above, and this comparison is also illustrated in Figure IV-1. As with the flow versus size plot, no relationship between age and process flow is evident. A figure is not provided for the cold worked mills using soluble oil solutions, as 90% of these mills currently achieve zero discharge which is the BPT requirement. Hence, the Agency concludes that the age of a mill has no affect on the ability to treat and recycle process wastewaters. Further analysis also indicated that mill age does not affect wastewater quantity.

The Agency also addressed the issue of retrofitting pollution control equipment as part of its plant age analysis. The ability to retrofit pollution control equipment has been demonstrated at several plants. These plants serve to illustrate that pollution control equipment can be retrofitted on existing production facilities without unreasonable difficulty or expense. In addition, the Agency analyzed the cost of retrofit, to determine whether older plants require additional capital expenditures for the installation of pollution control equipment over that required by new plants. This retrofit cost information was obtained from the industry through the D-DCPs. Since the industry indicated that no retrofit costs were incurred, the Agency concludes that the cost of retrofitting pollution control equipment on older mills is either minimal or not significant.

Based upon the above, the Agency finds that both old and newer production facilities generate similar raw wastewater pollutant loadings; that pollution control facilities can be and have been retrofitted to both old and newer production facilities without substantial retrofit costs; that these pollution control facilities can and are achieving the same effluent quality; and, that further subcategorization or further segmentation within this subcategory on the basis of age or size is not appropriate.

Geographic Location

The location of cold worked pipe and tube mills has no apparent effect upon segmentation. The Agency analyzed the relationship between mill location and process water use. No discernible pattern was revealed. Most pipe and tube mills are located in twelve states east of the Mississippi River and in Texas, California, Colorado, Utah, and Louisiana. It should be noted that cold worked mills using water achieve zero discharge, and cold worked mills using soluble oil solutions have a minimal blowdown which is disposed of by hauling at the BPT level. As explained in Section IX, the Agency has determined that it is appropriate to establish the BPT limitations at zero discharge based upon contract hauling of this blowdown. Since both operations readily attain zero discharge regardless of geographic location, this factor has no effect on segmentation.

Process Water Usage

DCP and D-DCP data, as well as sampled plant data, were used in determining the applied and discharge flow rates (gal/ton) for each mill. Flow averages and ranges in each of the two cold worked mill segments are presented in Table IV-1. The flow differences between the types of cold worked pipe and tube mills (water or oil) can be readily noted on this table. The Agency segmented this subdivision based upon process water usage.

TABLE IV-1

FLOW AVERAGES AND RANGES
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE MILLS

(All flows expressed in gal/ton)

	Applied Flow		Discharge Flow	
	Average(1)	Range(2)	Average(1)	Range(2)
Cold Worked Pipe and Tube (Using Water)	3,263.8	320-51,483	2,428.5	0-26,926
Cold Worked Pipe and Tube (Using Soluble Oil Solutions)	2,061.6	1,143-6,000	5.6	0-97.8

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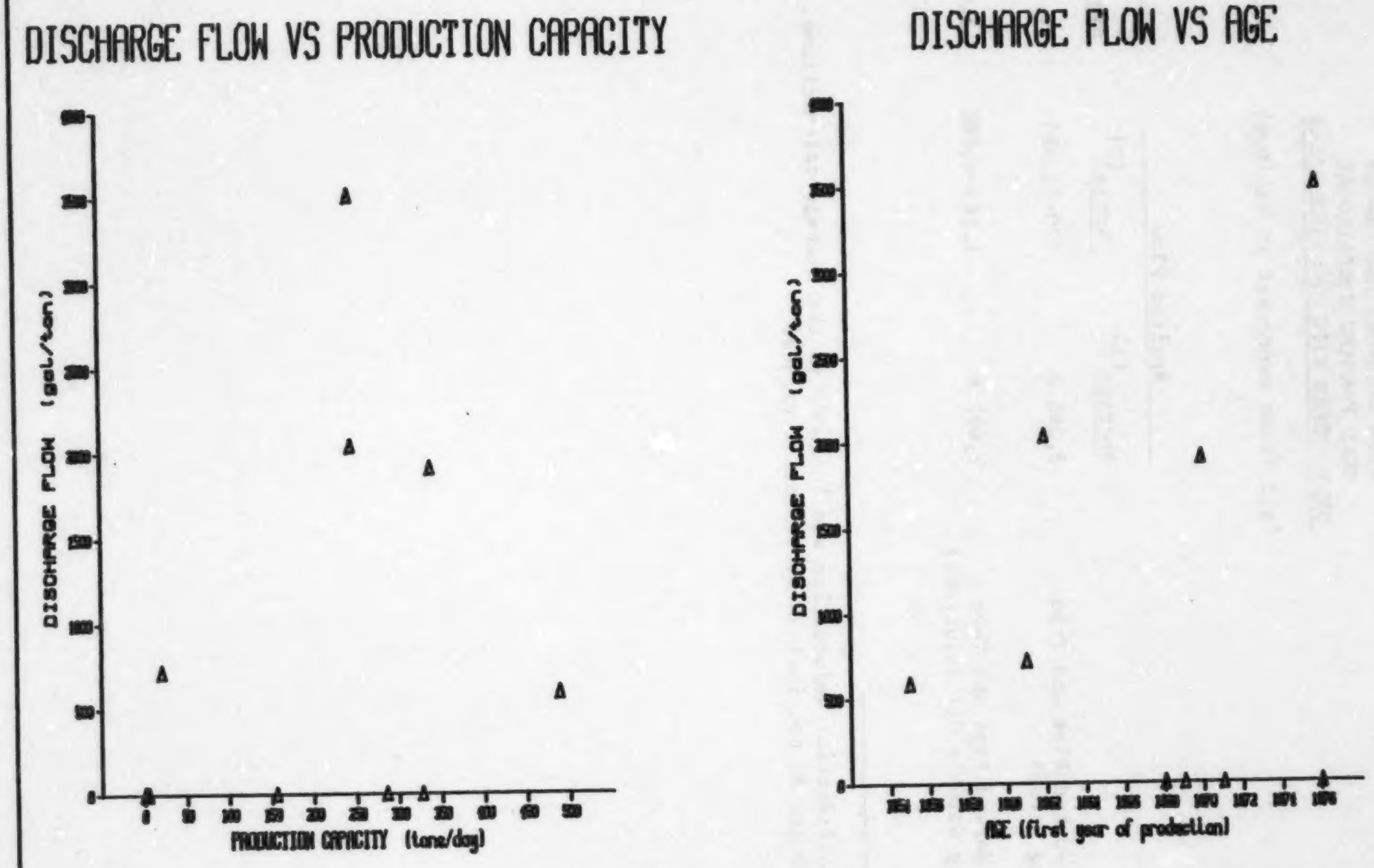
(1) Confidential information was included in the average calculations.
(2) Ranges do not include confidential values.

FIGURE IV-1
COLD FORMING SUBCATEGORY
COLD WORKED PIPE & TUBE
USING WATER



DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION V

WATER USE AND WASTEWATER CHARACTERIZATION

Introduction

Process water use and characterization of the wastewaters generated by the pipe and tube mills are the principal considerations used in determining pollutant loads, developing treatment alternatives, and estimating the costs of compliance with the limitations and standards. This section describes the wastewater treatment systems in use for cold worked pipe and tube operations and the wastewaters originating from the processes. The description of the wastewaters is limited to those process waters which come into contact with the process, product, by-product or raw materials, thus becoming contaiminated with pollutants characteristic of the process. This excludes waters used for noncontact cooling and nonprocess systems, i.e., utilities. Wastewater characterization is based upon analytical data obtained during field sampling surveys.

Water Use

Wastewaters are generated in cold worked operations as a result of the continuous flushing of the product, welders, or rolls, either with water or soluble oil solutions. Also, wastewaters are discharged from hydrostatic testing operations.

The cold worked pipe and tube mills generally have three main water systems.

1. Noncontact cooling water for annealing or normalizing furnaces.

2. Water or soluble oil solutions used for cooling or lubrication of welders, rollers, etc.

3. Hydrostatic testing waters.

The noncontact cooling waters are handled in once-through, tight recycle, or closed loop systems, depending upon mill water availability. As noted above, the waters are noncontact and, as such, exhibit only a temperature increase and are not considered herein.

Hydrostatic testing waters are typically reused in the testing of large tonnages of steels. These wastewaters are small in volume, variable, and are not included in the limitations set forth herein. Limitations for those wastewaters should be established on a case-by-case basis.

The contact wastewaters originating in cold worked operations using water are usually discharged to trenches beneath the pipe and tube mill stands and subsequently flushed into scale pits. Scale settles out in these pits, while an oil skimming device is used to remove insoluble oils. The treated wastewater from the scale pit is recycled to the process at most operations.

The soluble oil solutions used in cold worked operations using oil are continuously recycled through settling and storage tanks. In some instances, these solutions are filtered or cooled as they are recycled from the settling tank. The solids which accumulate in settling tanks are periodically removed. The solutions are recycled until they are removed for disposal by contractors.

Wastewater recycle is practiced in the two cold worked pipe and tube mill segments. Many of the mills using water and almost all of the mills using soluble oil solutions include high rate recycle. The use of recycle is considered a good conservation practice and, being widely demonstrated in both types of cold worked pipe and tube mill operations, has been included in the BPT and BAT model treatment systems.

In summary, the water and oil solutions used in cold worked pipe and tube mills are recycled to a high degree with only minimal blowdown from oil solution mills. This blowdown is hauled offsite for disposal at 79% of the oil solution plants. About 95% of the oil solution plants, including those that haul their wastes off-site, have no discharge to navigable waters. Four water solution plants, which constitute 40% of those plants that reported flow data, have no discharge. The other mills using water operate with partial recycle or in a once-through mode. There are no apparent factors that distinguish these mills from those which achieve zero discharge. As a result, the Agency believes that all mills using water are able to recycle their wastewaters to achieve zero discharge. Based on the above, the Agency believes that zero discharge is attainable for all cold worked pipe and tube mills, and has promulgated such limitations at the BPT level.

Wastewater Characterization

The cold worked process using water and cold worked process using soluble oil solutions both generate a fine scale as well as insoluble and water soluble oils and greases. Free oils and greases are present in wastewaters from both types of operations as a result of oil spills, line breaks, and equipment leaks and washdown. In addition, water soluble and emulsified oils are found in the mills using soluble oil solutions. The pH of cold worked pipe and tube wastewaters may be slightly acidic due to carry-over of acid from prior pickling operations.

Table V-1 presents the raw wastewater data for cold worked pipe and tube mills using water taking into account the respective pollutants in the intake water supply. The data indicate that toxic metal pollutants are contributed by these mills.

Table V-2 presents the available raw waste data for cold worked pipe and tube mills using oil. The data show that the oil solutions used in cold worked pipe and tube mills contain significant levels of toxic organic and metal pollutants.

Since similar oil solutions are used in both cold rolling and cold worked pipe and tube operations, similar pollutants are expected in all cold worked wastewaters. Extensive data have been collected for cold rolling operations. These data indicate that the presence of toxic organic pollutants is prevasive and highly variable. The wastewater data obtained for the oil solutions used in cold worked pipe of tube operation show similar characteristics.

TABLE V-1

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD FORMING - COLD WORKED PIPE AND TUBE
(USING WATER)

Raw Wastewater

Reference No.	256F (04-06)	856Q	
Plant Code	331A	336A	
Sample Points	B	E-A	
Applied Flow (gal/ton)	Unk	Unk	Average (1)
23 Chloroform	0.013	0.002	0.008
44 Methylene Chloride	0.022	0.00	0.011
66 Bis-(2-Ethylhexyl) phthalate	0.001	0.014	0.008
119 Chromium	<0.015	0.018	0.009
120 Copper	0.044	0.095	0.070
122 Lead	<0.025	0.00	0.00
124 Nickel	0.050	<0.050	0.025
128 Zinc	0.387	0.024	0.206

Unk: Unknown

(1): Less than values were included as zeros in the average calculation.

TABLE V-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD FORMING - COLD WORKED PIPE AND TUBE
(USING SOLUBLE OIL SOLUTIONS)

Raw Wastewater

Reference No.	256F (01-03)	684L (01-04)	684A	856H	856Q	548C	240B-03	240B-05	
Plant Code	331B	332	333	335	336B	337	338	338	
Sample Point	C	B	B	B	C	B	D	B	
Applied Flow (GPT)	Unk	Unk	2152	Unk	Unk	Unk	Unk	Unk	Average(1)
4 Benzene	0.006	0.001	<0.001	0.006	0.004	0.006	0.005	0.014	0.005
11 1,1,1-Trichloroethane	0.002	ND	<0.001	0.001	0.009	0.004	0.040	0.012	0.008
38 Ethylbenzene	0.004	ND	<0.001	0.008	0.038	0.002	0.010	0.001	0.008
39 Fluoranthene	0.038	0.035	0.002	ND	0.010	0.006	0.040	0.262	0.049
44 Methylene Chloride	0.012	0.020	0.030	0.014	0.004	0.020	0.024	0.010	0.017
55 Naphthalene	ND	ND	<0.001	ND	0.003	0.001	0.026	0.028	0.007
65 Phenol	0.12	ND	0.004	ND	ND	ND	ND	ND	0.016
66 Bis-(2-ethylhexyl) phthalate	0.086	0.22	ND	ND	0.044	0.075	0.072	ND	0.062
67 Butyl benzyl phthalate	ND	0.078	ND	ND	ND	ND	ND	ND	<0.010
68 Di-n-butyl phthalate	0.104	ND	0.003	ND	0.004	ND	ND	ND	0.014
70 Diethyl phthalate	0.094	0.12	ND	ND	ND	0.062	0.101	0.813	0.15
72 Benzo (a) anthracene	0.042	0.053	ND	ND	ND	0.006	0.040	ND	0.018
73 Benzo (a) pyrene	ND	0.022	ND	ND	ND	0.006	0.017	ND	0.006
78 Anthracene	0.426	0.022	0.010	ND	0.082	ND	0.364	2.11	0.377
80 Fluorene	0.076	0.241	ND	ND	ND	ND	ND	ND	0.040
84 Pyrene	0.058	0.045	0.002	ND	0.020	0.024	0.060	0.420	0.079
85 Tetrachloroethylene	0.507	ND	0.002	ND	0.112	0.002	ND	ND	0.078
86 Toluene	0.010	0.004	0.001	0.026	0.046	0.007	0.007	0.020	0.015
87 Trichloroethylene	0.002	0.006	ND	ND	0.013	0.706	0.006	0.003	0.092
119 Chromium	<0.015	<0.020	<0.01	NR	<0.015	1.33	1.2	0.448	0.425
120 Copper	1.92	0.491	<0.01	NR	0.220	1.27	8.93	0.870	1.957
122 Lead	0.412	0.900	<0.03	NR	0.058	0.725	<0.030	0.410	0.358
124 Nickel	0.30	0.431	<0.05	NR	0.050	0.060	2.67	0.060	0.510
128 Zinc	0.671	0.342	0.015	NR	0.233	2.98	26.5	4.0	4.963

Note: All values are expressed in mg/l unless otherwise noted.

(1) ND and less than values were included in the average calculation as zeros.

Unk: Unknown
ND : Not detected
NR : Not reported

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION VI

WASTEWATER POLLUTANTS

Introduction

As noted in Section V, the Agency believes that zero discharge of process wastes can be achieved at all cold worked pipe and tube operations. Nevertheless, the Agency has evaluated the wastewater data in order to characterize these wastewaters. This information is used to determine the pollutant load reductions presented in Section VIII.

Conventional Pollutants

Oil and grease, and suspended solids are characteristic of cold worked pipe and tube wastewaters. Oils and greases originate in the oil solutions and from equipment leaks at the process. Suspended solids are present in these wastewaters as a result of contamination by scale and dirt as the oil solutions and water are flushed over the stands and product.

Toxic Pollutants

Tables VI-1 and VI-2 lists the toxic pollutants found to be present in wastewaters from cold worked pipe and tube mills using water and oil, respectively. The data were acquired through sampling conducted by the Agency. Pollutants found at concentrations greater than 0.01 mg/l are considered characteristic of these wastewaters. Tables VI-3 and VI-4 list those toxic pollutants for both types of cold worked pipe and tube operations which were detected at average concentrations greater than 0.01 mg/l.

Some pollutants were detected at concentrations greater than 0.01 mg/l but are not listed on Tables VI-1 - VI-4. The agency believes the presence of those compounds is not due to the cold worked operation. Methylene chloride was omitted because this compound is commonly used as a cleaning agent in the laboratory and the Agency attributes its detection to this practice and not to the cold worked mills sampled. Also, the phthalate compounds are not believed to be characteristic of cold worked mill wastewaters. Their origin is probably related to plasticizers in the tubing used with automatic samplers.

For those operations using water, only toxic metal pollutants were found as presented in Table VI-3. As noted in Table VI-4, many toxic organic and metal pollutants were detected in the wastes from operations using oil. The major sources of these pollutants are the

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oils used at the mills. The exact nature of these oils is often proprietary, making it difficult to relate any of the pollutants to any one type of oil or brand name.

TABLE VI-1

TOXIC POLLUTANTS KNOWN TO BE PRESENT COLD FORMING - COLD WORKED PIPE AND TUBE (USING WATER)

23	Chloroform
119	Chromium
120	Copper
122	Lead
124	Nickel
128	Zinc

TABLE VI-2

TOXIC POLLUTANTS KNOWN TO BE PRESENT COLD FORMING - COLD WORKED PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)

4	Benzene
11	1,1,1-Trichloroethane
38	Ethylbenzene
39	Fluoranthene
55	Naphthalene
65	Phenol
72	Benzo (a) anthracene
73	Benzo (a) pyrene
78	Anthracene
80	Fluorene
84	Pyrene
85	Tetrachloroethylene
86	Toluene
87	Trichloroethylene
119	Chromium
120	Copper
122	Lead
124	Nickel
128	Zinc

TABLE VI-3

SELECTED POLLUTANTS
COLD FORMING - COLD WORKED PIPE AND TUBE (USING WATER)

120 Copper

124 Nickel

128 Zinc

TABLE VI-4

SELECTED POLLUTANTS
COLD FORMING - COLD WORKED PIPE AND TUBE
(USING SOLUBLE OIL SOLUTIONS)

39	Fluoranthene
65	Phenol
72	Benzo (a) Anthracene
78	Anthracene
80	Fluorene
84	Pyrene
85	Tetrachloroethylene
86	Toluene
87	Trichloroethylene
119	Chromium
120	Copper
122	Lead
124	Nickel
128	Zinc

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

Introduction

This section presents the treatment practices currently used within the cold worked pipe and tube subdivision of the cold forming subcategory. Data from the DCPs and plant visits provided the bases for the summary of treatment technologies used for cold worked mills.

The Agency determined the treatment practices in existence at cold worked pipe and tube operations to form the basis for evaluating other technologies, establish limitations, and estimate incremental pollution control costs. The alternative treatment systems developed and the corresponding effluent characteristics are summarized in Sections IX through XIII. The costs are summarized in Section VIII.

Summary of Treatment Practices Currently Employed

The treatment provided at most pipe and tube operations consists of sedimentation (primarily by scale pits), oil removal (by skimming), and recycle. Following is a description of the various treatment technologies employed by cold worked pipe and tube operations. This description is a summary of the data reported by the industry in the DCPs and further clarified by the industry in comments provided on the regulation proposed in January 1981. These comments resulted in the reclassification of certain mills into the water or oil subdivisions. The descriptions that follow reflect these changes. (See Tables III-1 and III-2 for treatment technologies used by each of the individual mills).

A. Cold Worked Pipe and Tube Plants Using Water

1. Sedimentation-Primary Scale Pit

   The primary scale pit serves to collect the heavier suspended particulate matter and allows tramp oils to float to the surface. Approximately 40% of the pipe and tube plants using water have primary scale pits.

2. Oil Skimmer

   Oil skimmers are used to remove the oils which accumulate in the scale pits. Approximately 47% of the pipe and tube plants using water have some type of oil skimming equipment.

3. **Recycle**

Recycling all or part of the process waters conserves water and minimizes or eliminates the discharge of pollutants. Approximately 40% of these plants recycle all or part of their process water.

B. Cold Worked Pipe and Tube Plants Using Soluble Oil Solutions

1. **Sedimentation-Primary Scale Pit**

Approximately 53% of these plants use primary scale pits to provide for removal of particulate matter and insoluble oil.

2. **Oil Skimming**

About 11% of these plants use some type of oil skimming device to remove insoluble oils.

3. **Recycle**

All of the plants recycle some portion of their process solutions.

4. **Contractor Removal**

A small fraction of the oil solution (about 0.5 gal/ton) is not recycled but is discharged to storage tanks and subsequently hauled off-site by a contractor for reclamation or disposal. About 79% of the plants dispose of spent oil solutions in this manner. Three other plants have no discharge of wastewaters from the plant site. One of these plants disposes the spent oil solution by ground application. In total 95% of the pipe and tube operations using oil, reported achieving zero discharge.

Summary of Sampling Visit Data

Eight cold worked pipe and tube mills using oil and two using water were visited during the original and current guidelines survey. Table VII-1 provides a legend for the various control and treatment technology abbreviations used in this and other tables throughout this report. Table VII-2 presents a summary of the raw and effluent data for the cold worked mills using water. Table VII-3 presents the raw and effluent data for the cold worked mills using oil.

Plant HH-2 was reevaluated and determined to be nonrepresentative of cold worked pipe and tube operations. The raw wastewater sampled during this visit was a mixture of many different finishing operations, (i.e., acid pickling and alkaline cleaning). These data were found not to be characteristic of cold worked pipe and tube operations and were subsequently eliminated from the data base. It is believed that the data collected during these more recent visits better describe the cold worked pipe and tube wastewaters.

Plants Visits

Plant 331A (0256F 04-06) - Figure VII-1

Plant 331A is a cold worked pipe and tube mill using water that produces stainless welded tubes. All process water requirements for each of the three mills are furnished by individual closed-loop systems. The tube cooling water is recirculated from a reservior in the mill base. City water is occasionally used to makeup looses due to evaporation. Also, torch cooling water is recriculated through a chiller.

Plant 331B (0256F 01-03) - Figure VII-2

Plant 331B is cold worked pipe and tube mill using oil that produces carbon steel welded tubes. A soluble oil solution is recirculated from a sump through a cooling tower for use at three individual mills. The system is a self-contained recirculation cooling system in which only minor evaporative losses result. These losses are replaced with fresh oil solution. There are no effluent discharges.

Plant 332 (0684L 01-04) - Figure VII-3

This cold worked pipe and tube mill using oil produces welded tubes. The process uses an oil solution which passes over the product and is then filtered before entering an oil pit. From here the solution is recirculated to the mill where it is reused. Each of the four mills has a filter and oil pit. Periodically some of the oil solution is blowndown to a holding tank and is then hauled off-site by a contractor.

Plant 333 (0684A) - Figure VII-4

Plant 333 is a cold worked pipe and tube mill using oil that produces electric welded pipe and tube products. Cold carbon steel enters the mill without any prior application of oil. Throughout the process a recirculated soluble oil solution is applied to the steel. The oil solution is recirculated through a basin to allow particulate matter to settle out of the solution. Sediment is continuously removed and fresh oil is added directly into the basin. Wastewater from the basin is discharged to a sewer which flows to the Mahoning River.

Plant 335 (0856N) - Figure VII-5

This cold worked pipe and tube mill using oil produces carbon steel welded pipe utilizing electric resistance welding. An oil solution is continuously applied to the steel during the process. The solution is recycled through an oil pit which discharges to a second oil pit. Solution is returned from the second oil pit with part of the flow entering the first oil pit directly. The remaining flow passes through a cooling tower before returning to the first oil pit. Normally, there is no discharge from the recycle system. In the event there is an overflow, it would be discharged to the pipe mill lagoon.

Plant 336A (0856Q-03) - Figure VII-6

Plant 336A is a cold worked pipe and tube mill using water that produces carbon steel welded tubes. Process wastewater is treated in two scale pits, each receiving discharges from different sources. One treats the discharge from the expander and scrubber while the other treats wastewater from the hydrostatic tester. The wastewaters are combined after passing through the scale pits. Before final discharge to the Monongahela River, the total flow, which now includes discharges from other plant operations, passes through a settling pit equipped with an oil skimmer.

Plant 336B (0856Q-04) - Figure VII-7

Plant 336B is a cold worked pipe and tube mill using oil which manufactures specialty steel welded tubes, utilizing electric resistance welding. The oil solution passes over the product and is discharged to a recirculation pit. From the recirculation pit the oil solution returns to the process. Occassionally, the oil solution is blowndown for removal by contractor.

Plant 337 (0548C) - Figure VII-8

This cold worked pipe and tube mill using oil produces carbon steel welded tubes. Cold steel enters the electric weld mills without prior cleaning. Oil is continuously applied to the steel throughout the process. The three electric weld mills are serviced by one recirculating system. The oil solution passes through a cyclone and filter before it is recirculated to the mills. Approximately twice a year the oil solution is replaced and reclaimed.

Plant 338 (0240B-03, 05) - Figure VII-9

At plant 338, two cold worked pipe and tube mills using oil which produce carbon steel welded tubes were sampled. At each of the mills oil solution is continuously applied to the carbon steel throughout the process. After the solution has passed over the product it enters an oil recirculation pit where the solution is then recycled to the process. Each of the two mills maintains its own recirculation system. Approximately twice a year the oil solution is blowndown and removed by a contract hauler.

EFFECT OF MAKE-UP WATER QUALITY

Where the mass loading of a limited pollutant in the make-up water to a process is small in relation to the raw waste loading of that pollutant, the impact of make-up water quality on wastewater treatment system performance is not significant, and, in many cases, not measurable. In these instances, the Agency has determined that the respective effluent limitations and standards should be developed and applied on a gross basis.

Tables VII-4 and VII-5 present an analysis of the effect of make-up water quality on the raw waste loadings of each pollutant limited in the regulation of the cold worked pipe and tube operations using water and oil, respectively. The data presented in the tables were obtained from cold rolling sampling surveys because no make-up water characteristics were available for cold worked pipe and tube operations. The analysis clearly demonstrated that the levels of pollutants in the intake water are insignificant compared to raw waste loadings. The Agency has determined that the limitations and standards should be applied on a gross basis, except to the extent provided by 40 CFR 122.63(h).

TABLE VII-1

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. **Operating Modes**

1. OT — Once-Through

2. Rt,s,n — Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n — Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn — Blowdown, where n = discharge as % of raw waste flow

B. **Control Technology**

10. DI — Deionization

11. SR — Spray/Fog Rinse

12. CC — Countercurrent Rinse

13. DR — Drag-out Recovery

C. **Disposal Methods**

20. H — Haul Off-Site

21. DW — Deep Well Injection

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 2

C. Disposal Methods (cont.)

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. Treatment Technology

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

D. **Treatment Technology (cont.)**

43.	FLt	Flocculation, where t = type t: L = Lime A = Alum P = Polymer M = Magnetic O = Other, footnote
44.	CY	Cyclone/Centrifuge/Classifier
44a.	DT	Drag Tank
45.	CL	Clarifier
46.	T	Thickener
47.	TP	Tube/Plate Settler
48.	SLn	Settling Lagoon, where n = days of retention time
49.	BL	Bottom Liner
50.	VF	Vacuum Filtration (of e.g., CL, T> or TP underflows)
51.	Ft,m,h	Filtration, where t = type m = media h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52.	CLt	Chlorination, where t = type t: A = Alkaline B = Breakpoint
53.	CO	Chemical Oxidation (other than CLA or CLB)

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 4

D. Treatment Technology (cont.)

54.	BOt	Biological Oxidation, where t = type t: An = Activated Sludge n = No. of Stages T = Trickling Filter B = Biodisc O = Other, footnote
55.	CR	Chemical Reduction (e.g., chromium)
56.	DP	Dephenolizer
57.	ASt	Ammonia Stripping, where t = type t: F = Free L = Lime C = Caustic
58.	APt	Ammonia Product, where t = type t: S = Sulfate N = Nitric Acid A = Anhydrous P = Phosphate H = Hydroxide O = Other, footnote
59.	DSt	Desulfurization, where t = type t: Q = Qualifying N = Nonqualifying
60.	CT	Cooling Tower
61.	AR	Acid Regeneration
62.	AU	Acid Recovery and Reuse
63.	ACt	Activated Carbon, where t = type t: P = Powdered G = Granular
64.	IX	Ion Exchange
65.	RO	Reverse Osmosis
66.	D	Distillation

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. Treatment Technology (cont.)

67.	AA1	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide

TABLE VII-2

SUMMARY OF ANALYTICAL DATA FROM TOXIC POLLUTANT STUDY COLD FORMING - COLD WORKED PIPE AND TUBE (USING WATER)

Raw Wastewater

Reference Code	256F (04-06)		856Q-03		
Plant Code	331A		336A		
Sample Point	B		E		
Applied Flow (GPT)	Unk		Unk		
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	Average(1)
120 Copper	0.044	Unk	0.095	Unk	0.070
124 Nickel	0.050	Unk	<0.050	Unk	0.025
128 Zinc	0.387	Unk	0.073	Unk	0.230

Effluent

Reference Code	256F (04-06)		856Q-03	
Plant Code	331A		336A	
Sample Point	-		G	
Discharge Flow (GPT)	0		Unk	
C&TT	SS		PSP, CNT 2(Unk), SS, SL(UNK)	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
120 Copper	-	-	0.113	Unk
124 Nickel	-	-	0.050	Unk
128 Zinc	-	-	0.072	Unk

Unk: Unknown
- : Zero discharge of pollutants to navigable waters.

(1) The less than value was included in the average calculation as a zero.

TABLE VII-3

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD FORMING - COLD WORKED PIPE AND TUBE
(USING SOLUBLE OIL SOLUTIONS)

Raw Wastewater								
Reference Code	256F (01-03)		684L (01-04)		684A		856N	
Plant Code	331B		332		333		335	
Sample Point	C		B		B		B	
Applied Flow (GPT)	Unk		Unk		2152		Unk	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
39 Fluoranthene	0.038	Unk	0.035	Unk	0.002	0.000018	ND	Unk
65 Phenol	0.12	Unk	ND	Unk	0.004	0.000036	ND	Unk
72 Benzo (a) anthracene	0.042	Unk	0.053	Unk	ND	ND	ND	Unk
78 Anthracene	0.426	Unk	0.0241	Unk	0.010	0.000090	ND	Unk
80 Fluorene	0.076	Unk	ND	Unk	ND	ND	ND	Unk
84 Pyrene	0.058	Unk	0.045	Unk	0.002	0.000018	ND	Unk
85 Tetrachloroethylene	0.507	Unk	ND	Unk	0.002	0.000018	ND	Unk
86 Toluene	0.010	Unk	0.004	Unk	0.001	0.0000090	0.026	Unk
87 Trichlorethylene	0.002	Unk	0.006	Unk	ND	ND	ND	Unk
119 Chromium	<0.015	Unk	<0.020	Unk	<0.010		NR	Unk
120 Copper	1.92	Unk	0.491	Unk	<0.010		NR	Unk
122 Lead	0.412	Unk	0.900	Unk	<0.030		NR	Unk
124 Nickel	0.30	Unk	0.431	Unk	<0.050		NR	Unk
128 Zinc	0.671	Unk	0.342	Unk	0.015	0.00013	NR	Unk

Effluent								
Reference Code	256F(01-03)		684L(01-04)		684A		856N	
Plant Code	331B		332		333		335	
Sample Point	-		-		B		-	
Discharge Flow (GPT)	0		0		107.6		0	
C&TT	CNT 1(100),CT,H		FFOP,PSP,H		PSP		PSP,CT,H	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
39 Fluoranthene	-	-	-	-	0.002	0.000009	-	-
65 Phenol	-	-	-	-	0.004	0.000002	-	-
72 Benzo (a) anthracene	-	-	-	-	ND	ND	-	-
78 Anthracene	-	-	-	-	0.010	0.0000045	-	-
80 Fluorene	-	-	-	-	ND	ND	-	-
84 Pyrene	-	-	-	-	0.002	0.0000090	-	-
85 Tetrachloroethylene	-	-	-	-	0.002	0.0000090	-	-
86 Toluene	-	-	-	-	0.001	0.0000045	-	-
87 Trichlorethylene	-	-	-	-	ND	ND	-	-
119 Chromium	-	-	-	-	<0.010		-	-
120 Copper	-	-	-	-	<0.010		-	-
122 Lead	-	-	-	-	<0.030		-	-
124 Nickel	-	-	-	-	<0.050		-	-
128 Zinc	-	-	-	-	0.015	0.0000067	-	-

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD FORMING - COLD WORKED PIPE AND TUBE
(USING SOLUBLE OIL SOLUTIONS)
PAGE 2

Raw Wastewater

Reference Code	856Q-04		548C		240B-03		240B-05		
Plant Code	336B		337		338		338		
Sample Point	C		B		D		B		
Applied Flow (GPT)	Unk		Unk		Unk		Unk		Average(1)
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l
39 Fluoranthene	0.010	Unk	0.006	Unk	0.040	Unk	0.262	Unk	0.049
65 Phenol	ND	Unk	ND	Unk	ND	Unk	ND	Unk	0.016
72 Benzo (a) anthracene	ND	Unk	0.006	Unk	0.040	Unk	ND	Unk	0.018
78 Anthracene	0.082	Unk	ND	Unk	0.364	Unk	2.11	Unk	0.377
80 Fluorene	ND	Unk	ND	Unk	ND	Unk	ND	Unk	0.040
84 Pyrene	0.020	Unk	0.024	Unk	0.060	Unk	0.420	Unk	0.079
85 Tetrachloroethylene	0.112	Unk	0.002	Unk	ND	Unk	ND	Unk	0.078
86 Toluene	0.046	Unk	0.007	Unk	0.007	Unk	0.020	Unk	0.015
87 Trichlorethylene	0.013	Unk	0.706	Unk	0.006	Unk	0.003	Unk	0.092
119 Chromium	<0.015	Unk	1.33	Unk	1.2	Unk	0.448	Unk	0.425
120 Copper	0.220	Unk	1.27	Unk	8.93	Unk	0.877	Unk	1.957
122 Lead	0.058	Unk	0.725	Unk	<0.030	Unk	0.410	Unk	0.358
124 Nickel	0.050	Unk	0.060	Unk	2.67	Unk	0.060	Unk	0.510
128 Zinc	0.233	Unk	2.98	Unk	26.5	Unk	4.00	Unk	4.963

Effluent

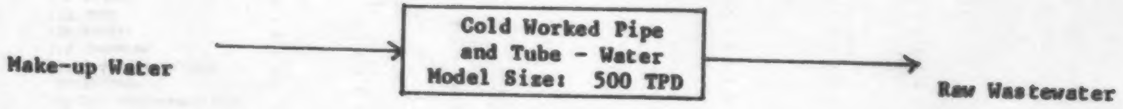
Reference Code	856Q-04		548C		240B-03		240B-05	
Plant Code	336B		337		338		338	
Sample Point	-		-		-		-	
Discharge Flow (GPT)	0		0		0		0	
C&TT	PSP, H		CNT 1(100), CY, FFOP, H		H		H	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
39 Fluoranthene	-	-	-	-	-	-	-	-
65 Phenol	-	-	-	-	-	-	-	-
72 Benzo (a) anthracene	-	-	-	-	-	-	-	-
78 Anthracene	-	-	-	-	-	-	-	-
80 Fluorene	-	-	-	-	-	-	-	-
84 Pyrene	-	-	-	-	-	-	-	-
85 Tetrachloroethylene	-	-	-	-	-	-	-	-
86 Toluene	-	-	-	-	-	-	-	-
87 Trichlorethylene	-	-	-	-	-	-	-	-
119 Chromium	-	-	-	-	-	-	-	-
120 Copper	-	-	-	-	-	-	-	-
122 Lead	-	-	-	-	-	-	-	-
124 Nickel	-	-	-	-	-	-	-	-
128 Zinc	-	-	-	-	-	-	-	-

Unk: Unknown
- : No discharge of pollutants to navigable water.
ND : Not detected
NR : Not reported

(1) Less than values were included as zeros in the average calculation.

TABLE VII-4

NET CONCENTRATION AND LOAD ANALYSIS
COLD FORMING: COLD WORKED PIPE AND TUBE - WATER


Make-up Water
Cold Worked Pipe
and Tube - Water
Model Size: 500 TPD
Raw Wastewater

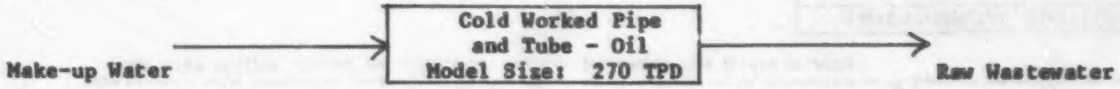
500 TPD x 296 GPT = 148,000 GPD

500 TPD x 2,960 GPT = 1.48 MGD

Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	<5.0	6.7	4.6	5.68	65	802.3	0.71
Total Suspended Solids	0.80	6.0	2.6	3.21	25	308.6	1.04

TABLE VII-5

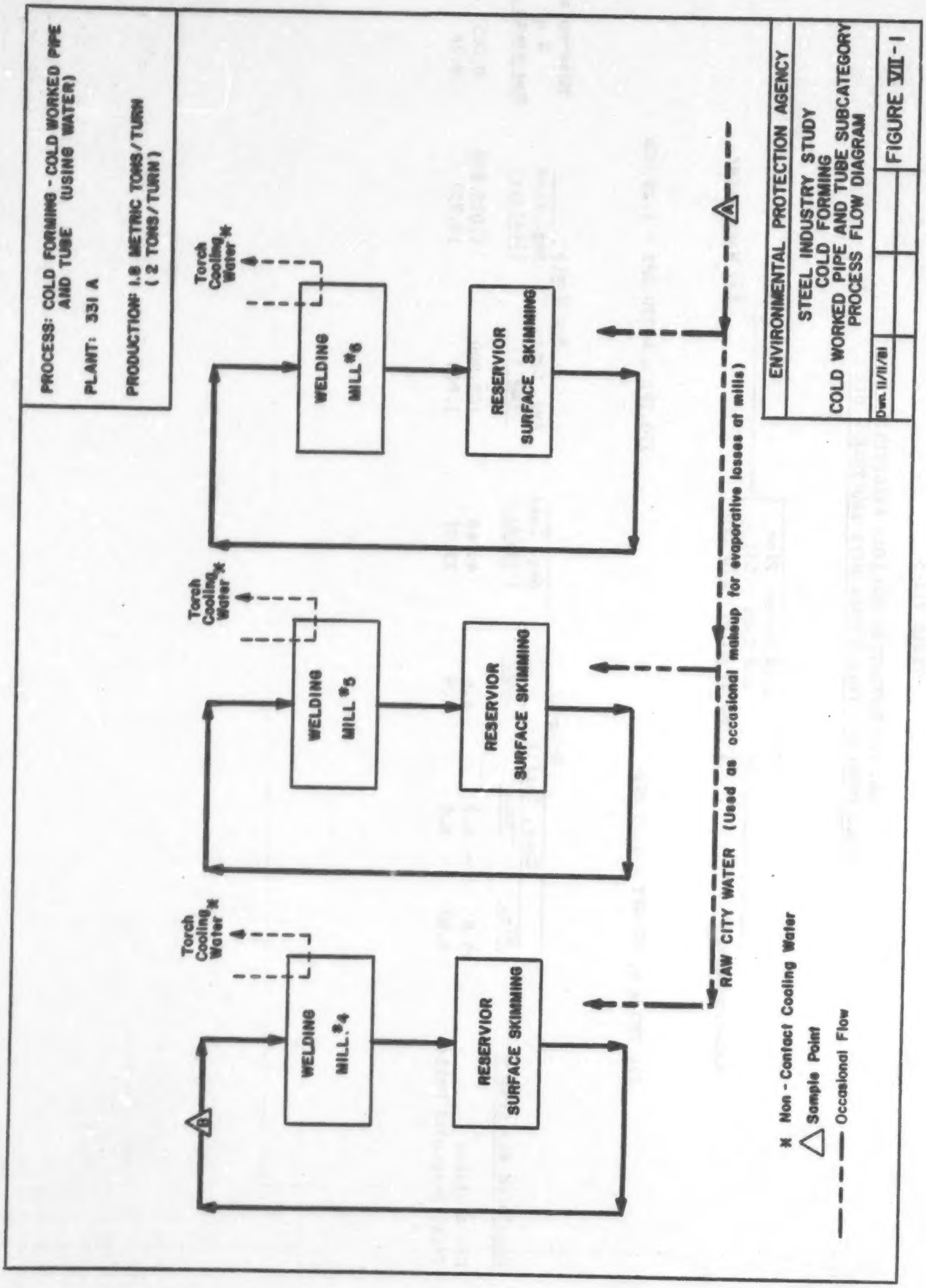
NET CONCENTRATION AND LOAD ANALYSIS
COLD FORMING: COLD WORKED PIPE AND TUBE - OIL


Make-up Water
Cold Worked Pipe
and Tube - Oil
Model Size: 270 TPD
Raw Wastewater

270 TPD x 4,770 GPT = 1.29 MGD

270 TPD x 4,770 GPT = 1.29 MGD

Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	<5.0	6.7	4.6	49.49	100,000	1,075,860	0.005
Total Suspended Solids	0.80	6.0	2.6	27.97	1,000	10,759	0.26


PROCESS: COLD FORMING - COLD WORKED PIPE AND TUBE (USING WATER)
PLANT: 331 A
PRODUCTION: 1.8 METRIC TONS/TURN (2 TONS/TURN)
Torch Cooling Water*
WELDING MILL #4
WELDING MILL #5
WELDING MILL #6
RESERVIOR SURFACE SKIMMING
RAW CITY WATER (Used as occasional makeup for evaporative losses at mills)
A
B
* Non - Contact Cooling Water
Sample Point
Occasional Flow
Dwn. 11/11/81

ENVIRONMENTAL PROTECTION AGENCY

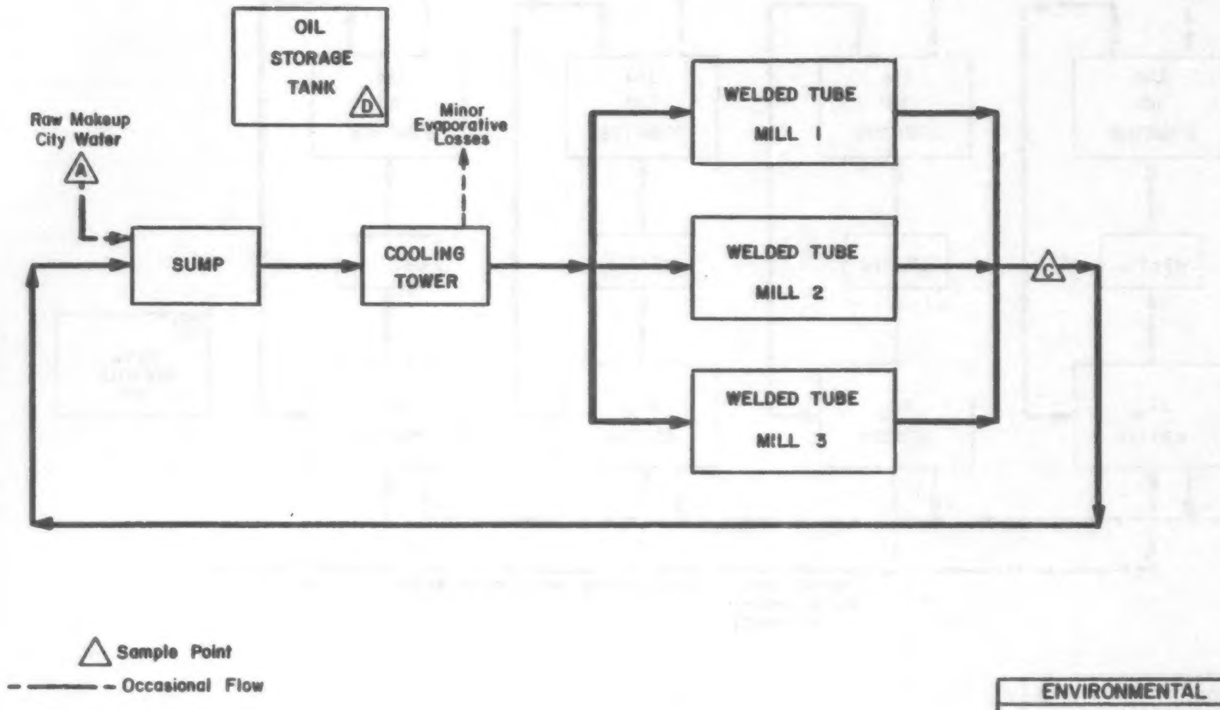
STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM

FIGURE VII-1

PROCESS: COLD FORMING - COLD WORKED PIPE AND TUBE (Using Soluble Oil Solution)

PLANT: 331 B

PRODUCTION: 68 METRIC TONS/TURN
(75 TONS/TURN)


OIL STORAGE TANK
D
Raw Makeup City Water
A
SUMP
COOLING TOWER
Minor Evaporative Losses
WELDED TUBE MILL 1
WELDED TUBE MILL 2
WELDED TUBE MILL 3
C
Sample Point
Occasional Flow

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM

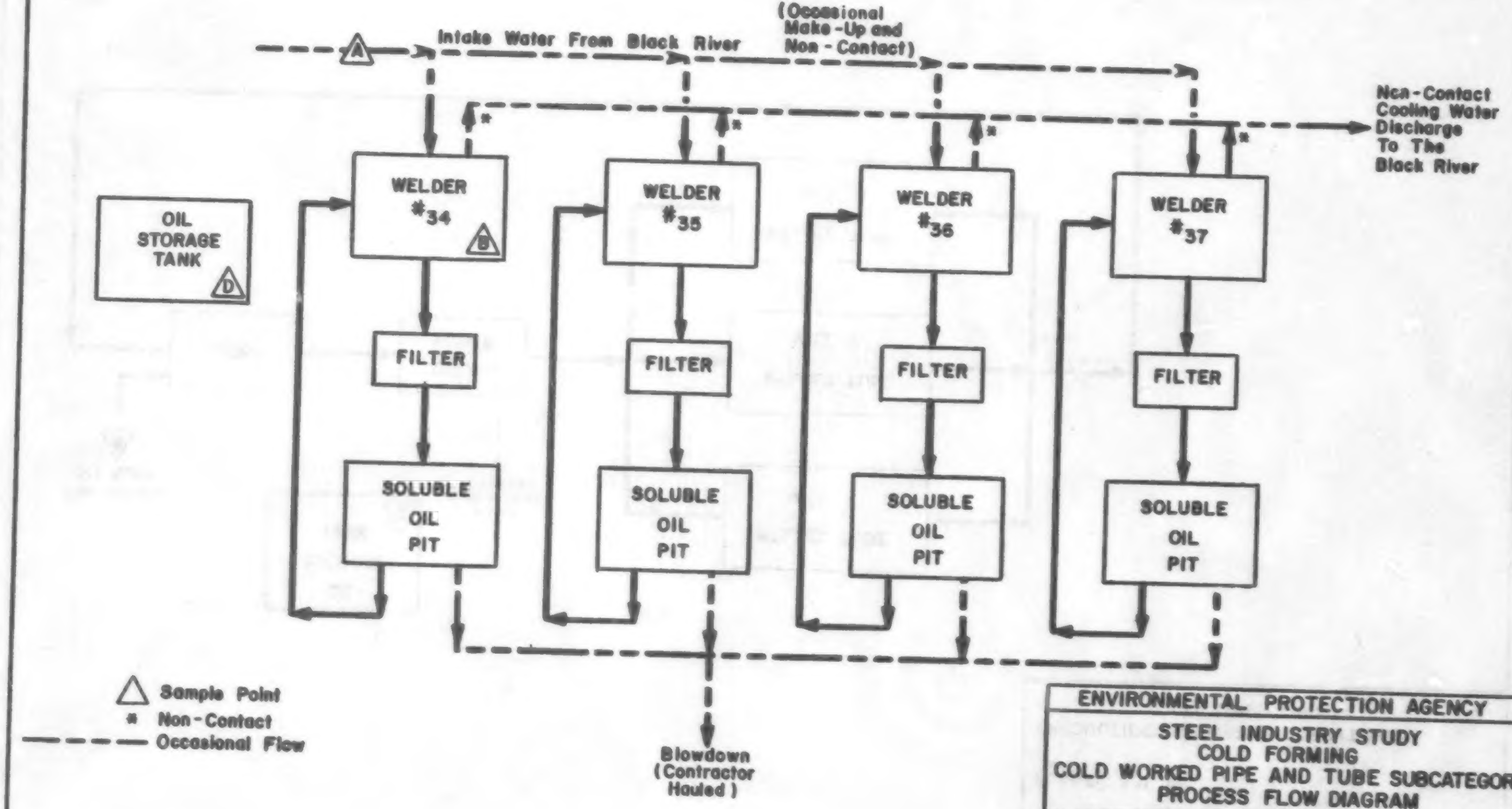
Dwn. 11/11/81

FIGURE VII-2

PROCESS: COLD FORMING - COLD WORKED PIPE AND TUBE (Using Soluble Oil Solution)

PLANT: 332

PRODUCTION: 47 METRIC TONS/TURN
(52 TONS/TURN)

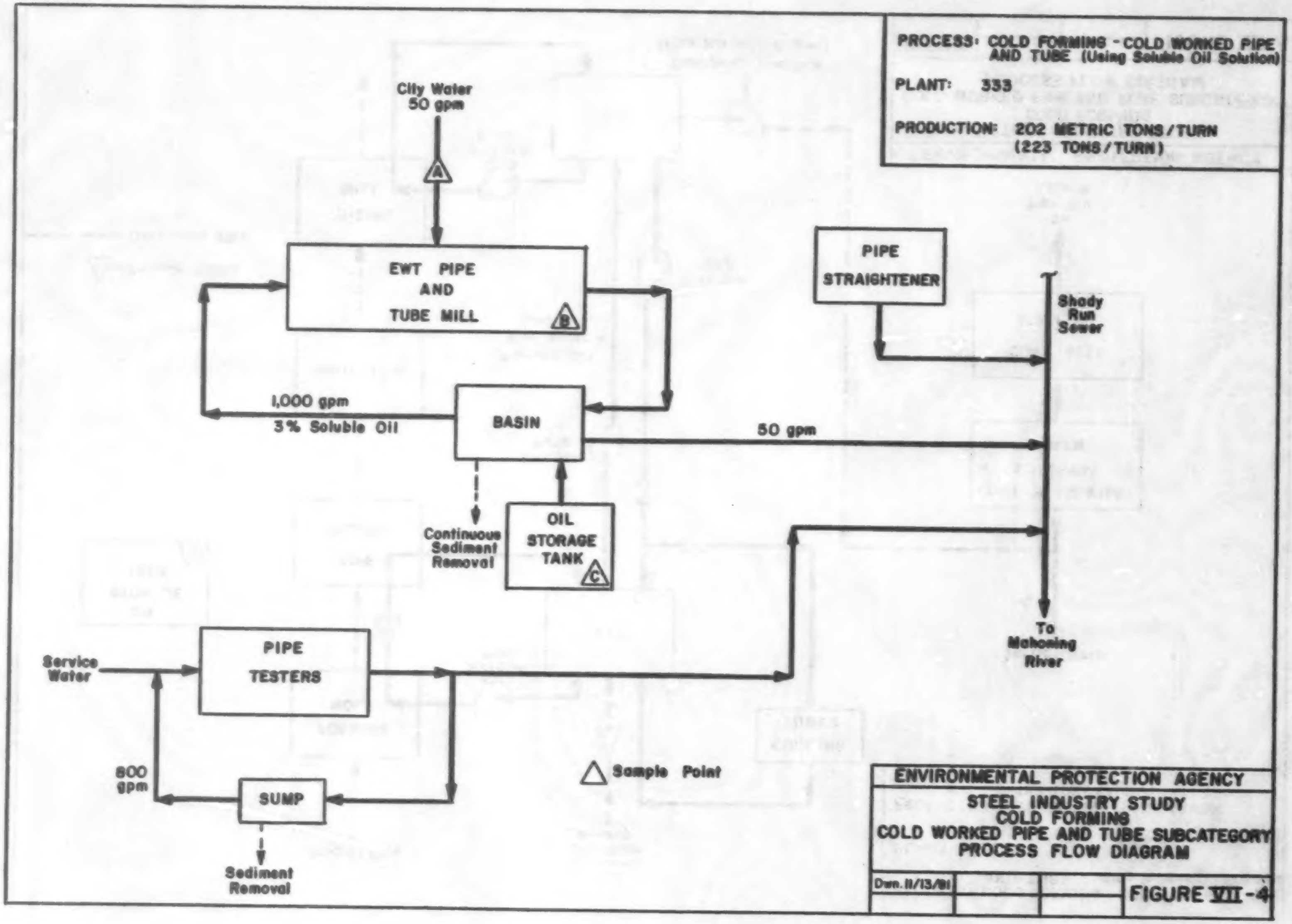

A
Intake Water From Black River
(Occasional Make-Up and Non-Contact)
Non-Contact Cooling Water Discharge To The Black River
OIL STORAGE TANK
D
WELDER #34
B
WELDER #35
WELDER #36
WELDER #37
*
FILTER
SOLUBLE OIL PIT
Blowdown (Contractor Hauled)
Sample Point
* Non-Contact
Occasional Flow

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM

Dwn. 11/13/81

FIGURE VII-3


City Water
50 gpm
A
EWT PIPE
AND
TUBE MILL
B
1,000 gpm
3% Soluble Oil
BASIN
50 gpm
Continuous
Sediment
Removal
OIL
STORAGE
TANK
C
PIPE
STRAIGHTENER
Shady
Run
Sewer
To
Mahoning
River
Service
Water
PIPE
TESTERS
800
gpm
SUMP
Sediment
Removal
Sample Point
Dwn. 11/13/81

PROCESS: COLD FORMING - COLD WORKED PIPE AND TUBE (Using Soluble Oil Solution)

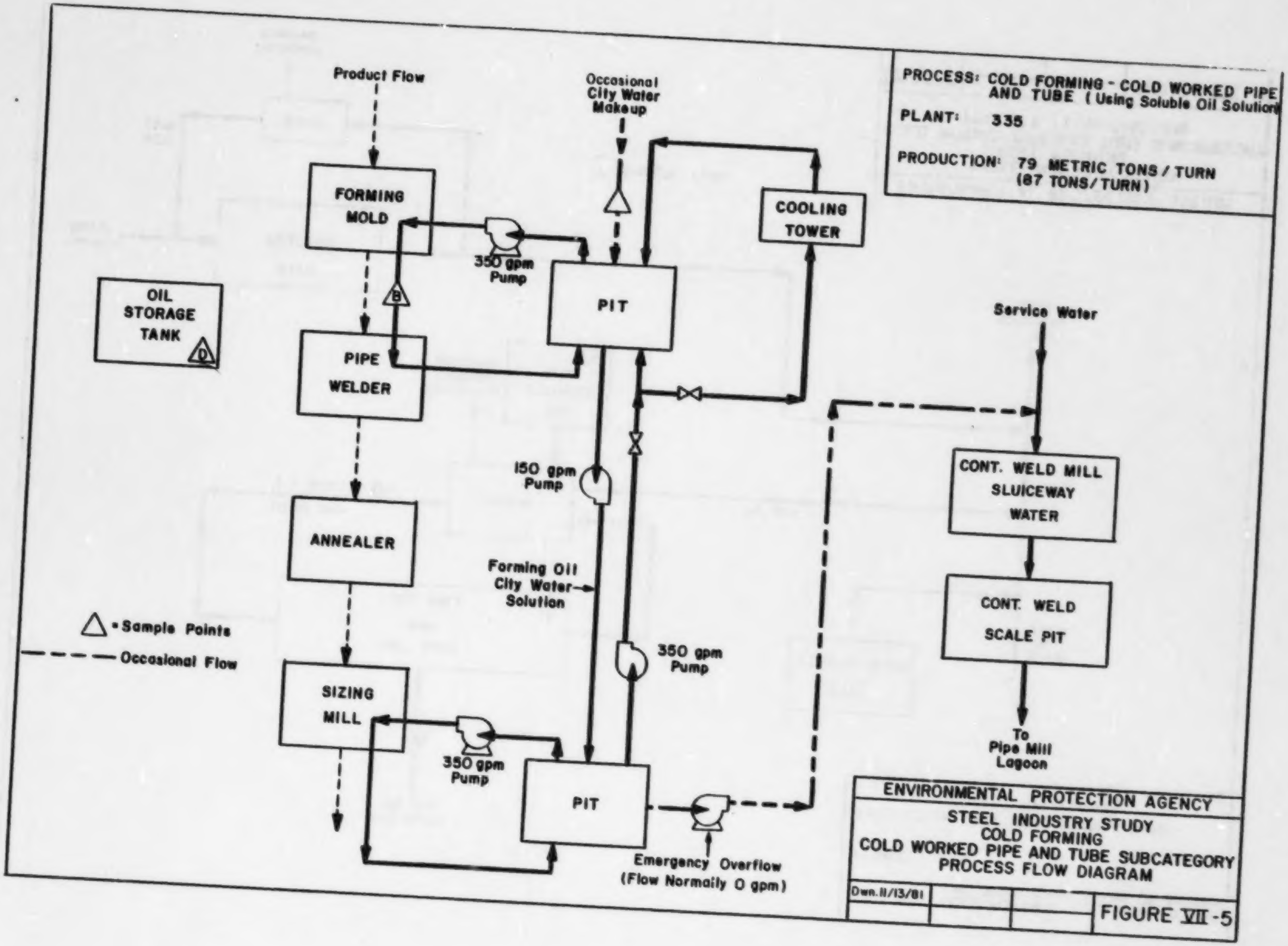
PLANT: 333

PRODUCTION: 202 METRIC TONS/TURN
(223 TONS/TURN)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM

FIGURE VII-4



PROCESS: COLD FORMING - COLD WORKED PIPE AND TUBE (Using Soluble Oil Solution)
PLANT: 335
PRODUCTION: 79 METRIC TONS / TURN
(87 TONS/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM
Dwn. 11/13/81

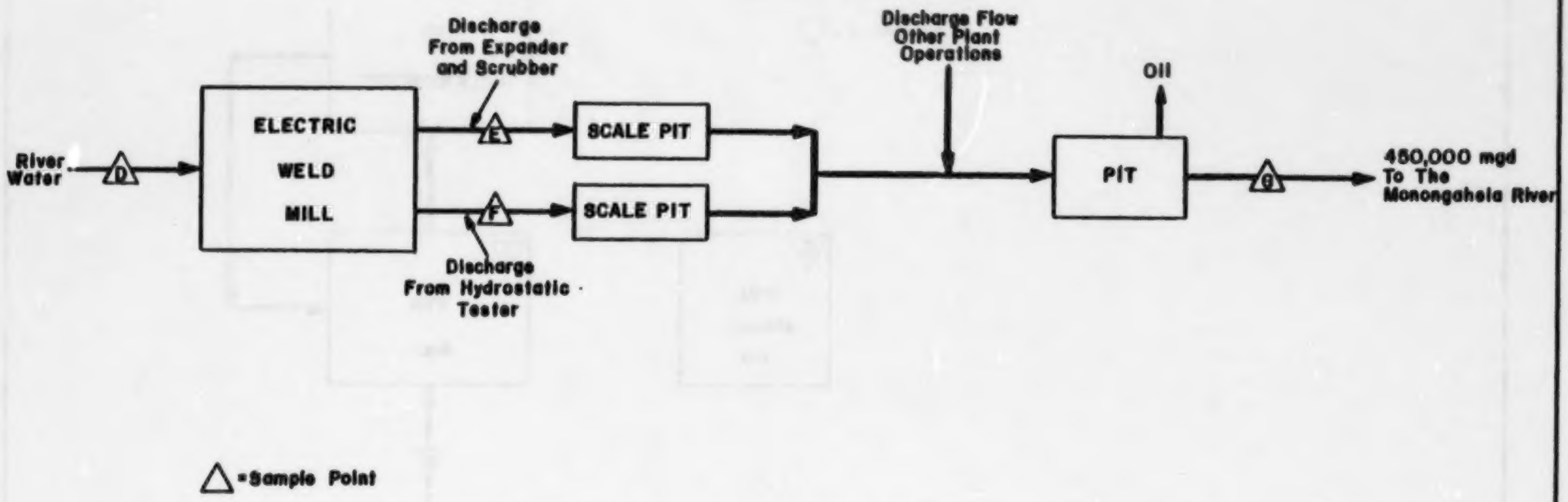
FIGURE VII-5

Product Flow
FORMING MOLD
350 gpm Pump
B
OIL STORAGE TANK
D
PIPE WELDER
ANNEALER
SIZING MILL
350 gpm Pump
Occasional City Water Makeup
PIT
COOLING TOWER
150 gpm Pump
Forming Oil City Water Solution
350 gpm Pump
PIT
Emergency Overflow (Flow Normally 0 gpm)
Service Water
CONT. WELD MILL SLUICEWAY WATER
CONT. WELD SCALE PIT
To Pipe Mill Lagoon
△ = Sample Points
— — — Occasional Flow

PROCESS: COLD FORMING - COLD WORKED PIPE AND TUBE (Using Water)

PLANT: 336 A

PRODUCTION: 349 METRIC TONS / TURN
(385 TONS/TURN)


River Water
D
ELECTRIC
WELD
MILL
Discharge From Expander and Scrubber
E
Discharge From Hydrostatic Tester
F
SCALE PIT
SCALE PIT
Discharge Flow Other Plant Operations
Oil
PIT
G
450,000 mgd To The Monongahela River
=Sample Point

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM

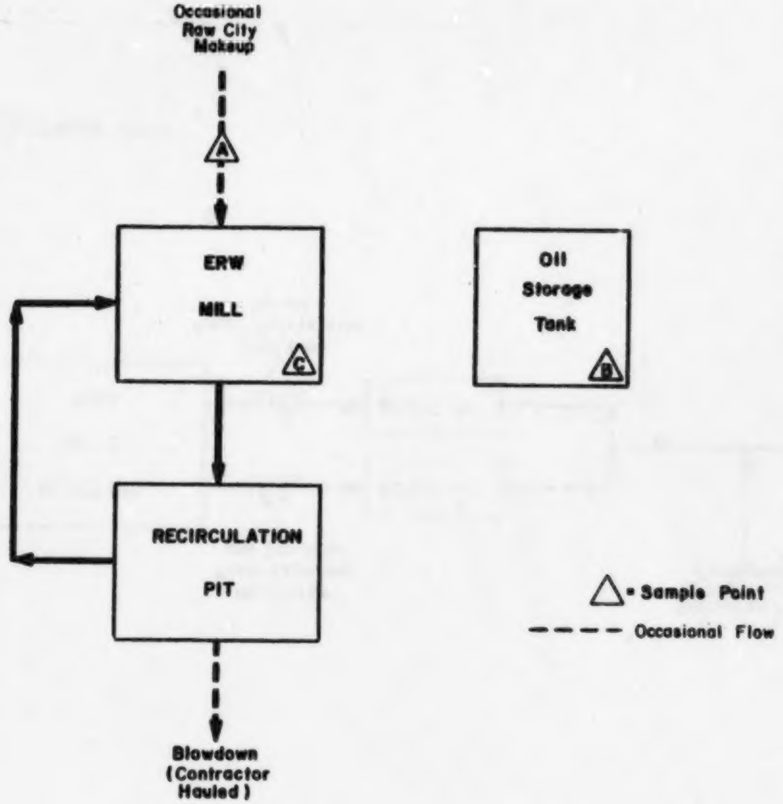
Dwn. 11/16/81

FIGURE VII-6

PROCESS: COLD FORMING - COLD WORKED PIPE AND TUBE. (Using Soluble Oil Solution)

PLANT: 336 B

PRODUCTION: 335 METRIC TONS/TURN
(369 TONS/TURN)

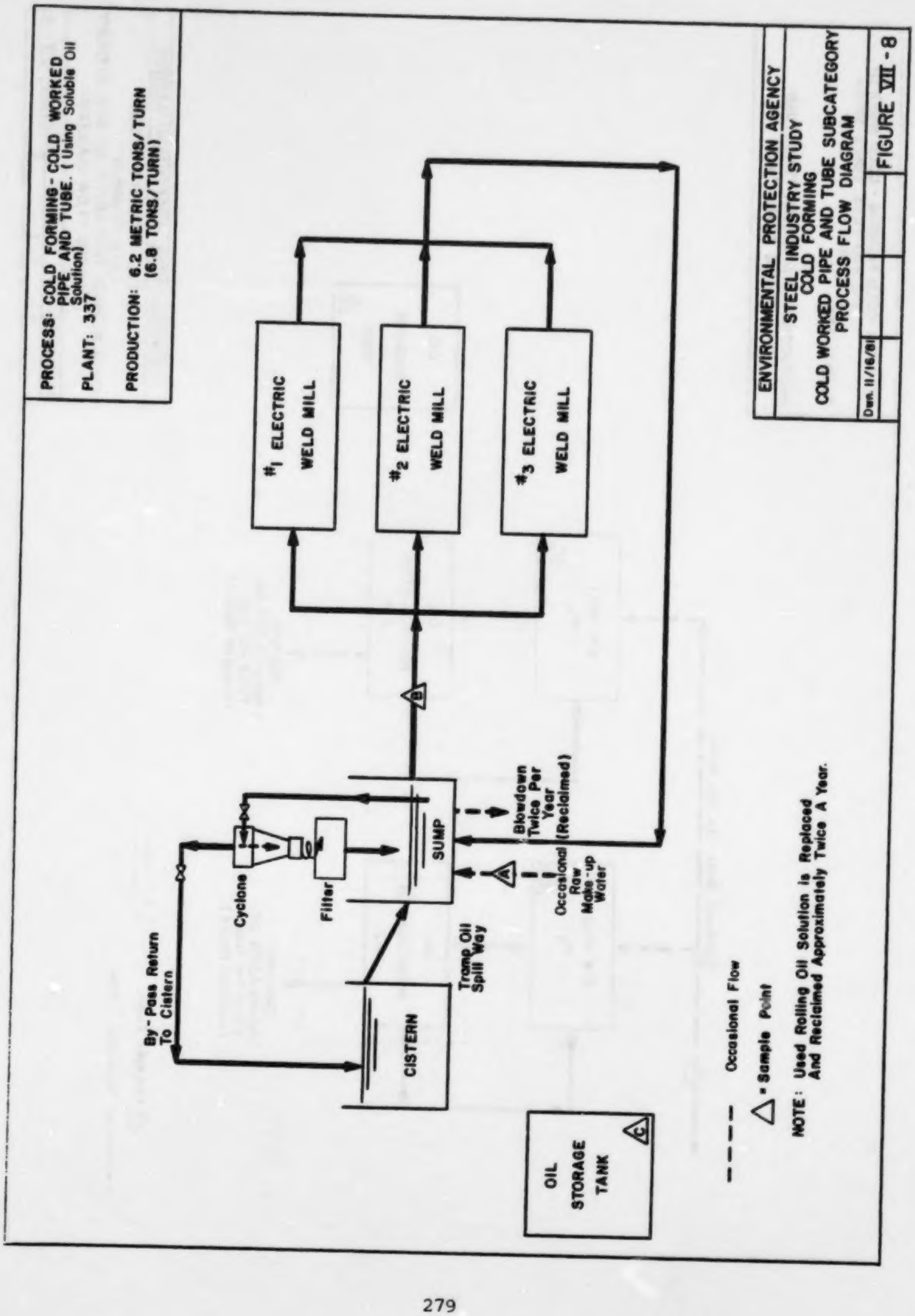

Occasional Raw City Makeup
A
ERW
MILL
C
Oil
Storage
Tank
B
RECIRCULATION
PIT
Blowdown (Contractor Hauled)
△ = Sample Point
- - - - Occasional Flow

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM

Dwn. 11/16/81

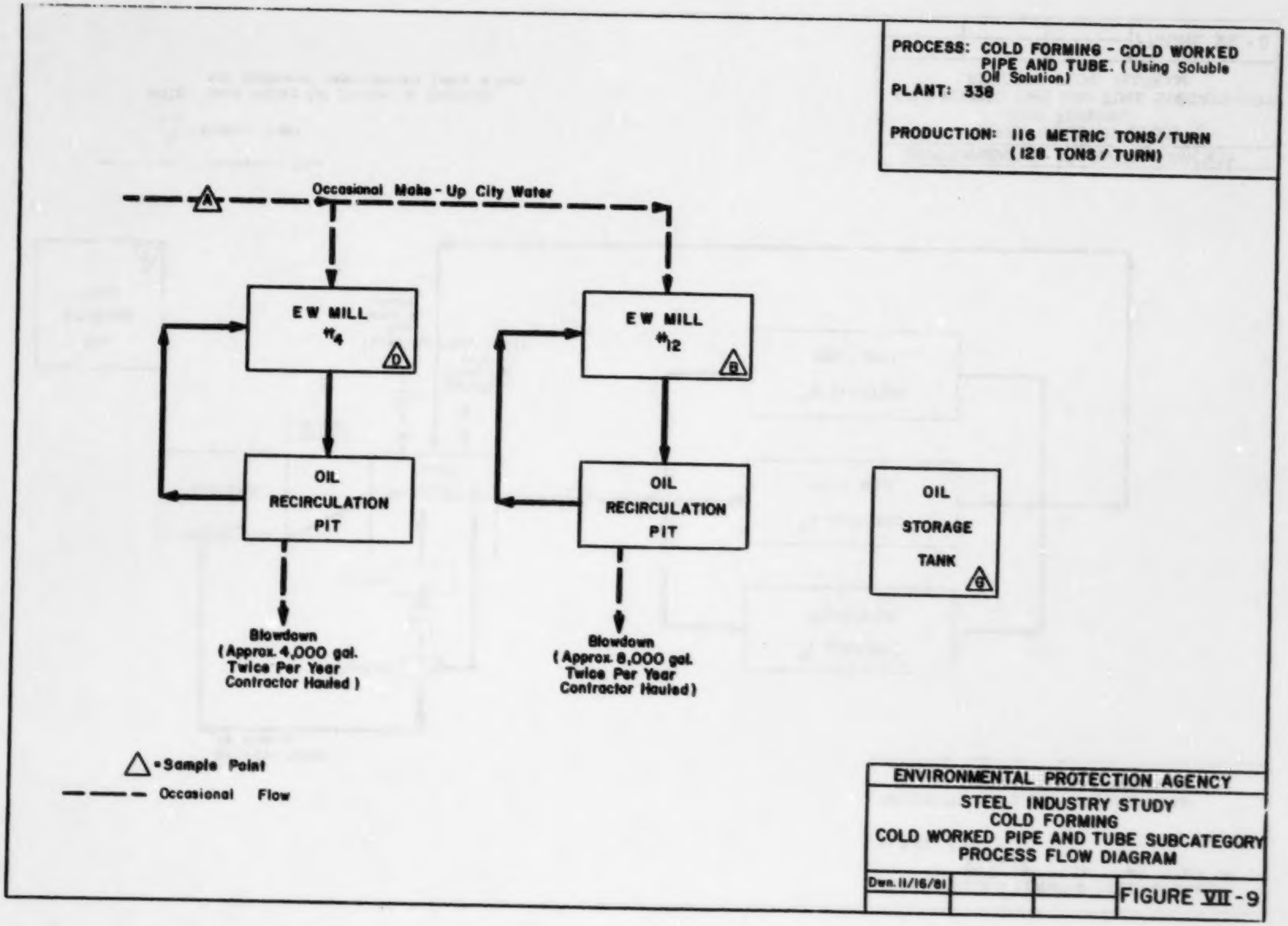
FIGURE VII - 7


PROCESS: COLD FORMING- COLD WORKED PIPE AND TUBE. (Using Soluble Oil Solution)
PLANT: 337
PRODUCTION: 6.2 METRIC TONS/ TURN (6.8 TONS/TURN)
#1 ELECTRIC WELD MILL
#2 ELECTRIC WELD MILL
#3 ELECTRIC WELD MILL
B
By-Pass Return To Cistern
Cyclone
Filter
SUMP
Blowdown Twice Per Year (Reclaimed)
A
Occasional Raw Make-up Water
Tramp Oil Spill Way
CISTERN
OIL STORAGE TANK
C
Occasional Flow
= Sample Point
NOTE: Used Rolling Oil Solution is Replaced And Reclaimed Approximately Twice A Year.
Dwn. 11/16/81

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM

FIGURE VII-8



PROCESS: COLD FORMING - COLD WORKED PIPE AND TUBE. (Using Soluble Oil Solution)

PLANT: 338

PRODUCTION: 116 METRIC TONS/TURN
(128 TONS / TURN)

Occasional Make - Up City Water
A
E W MILL #4
D
OIL RECIRCULATION PIT
Blowdown (Approx. 4,000 gal. Twice Per Year Contractor Hauled)
E W MILL #12
B
OIL RECIRCULATION PIT
Blowdown (Approx. 8,000 gal. Twice Per Year Contractor Hauled)
OIL STORAGE TANK
G
△ = Sample Point
— — — Occasional Flow

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING
COLD WORKED PIPE AND TUBE SUBCATEGORY
PROCESS FLOW DIAGRAM

Dwn. 11/16/81

FIGURE VII-9

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION VIII

COST, ENERGY, AND NON-WATER QUALITY IMPACTS

Introduction

This section addresses the cost, energy, and non-water quality impacts of applying different levels of pollution control technology to cold worked pipe and tube operations. The following topics are discussed: actual treatment costs incurred by plants surveyed; the treatment technologies and systems recommended for use in the cold worked pipe and tube subdivision; and the cost, energy, and other non-water quality impacts associated with the application of BPT, BAT, BCT, NSPS, PSES, and PSNS. In addition, the consumptive use of water is addressed.

Actual Costs Incurred At the Plant Surveyed for This Study

The water pollution control costs for the plants surveyed during this study are presented in Table VIII-1. These costs were derived from data presented in response to the D-DCPs. The costs have been adjusted to July 1978 dollars.

Control and Treatment Technology

The treatment components and systems considered by the Agency are presented in Tables VIII-2 and VIII-3. These tables provide a basic summary of the treatment technologies which comprise the treatment models for the cold worked pipe and tube subdivision of the cold forming subcategory.

The following items are described for each step:

1. Description of treatment and/or control methods
2. Implementation time
3. Land requirements

Figure VIII-1 illustrates the alternative treatment system developed for cold worked pipe and tube operations using water. For operations using oil, the alternative treatment systems are presented in Figures VIII-2 and VIII-3.

Cost, Energy, and Non-water Quality Impacts

The installation of BPT, BCT, BAT, NSPS, PSES, and PSNS systems may require additional investmant and energy consumption and may affect solid waste disposal and water consumption. The Agency estimated costs and energy requirements on the basis of alternative treatment systems developed in Sections IX through XIII of this report. These costs and energy requirements are presented in this section.

Estimated Costs for the Installation of Pollution Control Technologies

A. Cost Required to Achieve the BPT Limitations

In order to develop BPT compliance costs, the Agency developed BPT model treatment systems sized for the average cold worked pipe and tube plants found in the United States. Because of different flow rates, separate models were necessary for the water and soluble oil mill processes. The model sizes (tons/day) were developed on the basis of the average production capacities of water and soluble oil plants. The treatment model applied flows were also developed using industry average flow rates. The components and effluent flows discussed in Section IX were then used to complete the development of the treatment models.

The BPT model costs are presented in Tables VIII-4 and VIII-5 for the pipe of tube mills using water and oil, respectively. Not all plants will incur all of these cost outlays, as many are already operating at or near BPT. The industry-wide cost represents the sum of the costs for the individual mills. The costs for the individual mills were calculated by adjusting the model costs to the size of mill using the 0.6 rule.

The Agency estimates the capital costs of the BPT model treatment system for all cold worked pipe and tube plants using water to be $4.06 million. Of this total, $3.30 million is for treatment facilities in-place as of July 1981, and $0.76 million is associated with treatment which remains to be installed. The estimated industry-wide annual cost to achieve the BPT limitations for cold worked pipe and tube (using water) wastewaters is $0.53 million. The annual cost associated with the treatment facilities remaining to be installed is $0.10 million.

The Agency estimates the capital costs to meet the BPT limitations for all of the cold worked pipe and tube plants using soluble oil solutions to be $3.09 million. All of the necessary treatments technology except for $0.02 million is currently in-place. The estimated industry wide annual operating cost of the BPT limitations for cold worked pipe and tube (using soluble oil solutions) wastewaters is $0.40 million. Costs for contract disposal of the waste oil solutions are included in the annual costs.

B. Costs Required to Achieve the BAT Limitations

No BAT alternative treatment systems were evaluated for the cold worked pipe of tube subdivision. The BPT model treatment system achieves zero discharge. Since these wastewaters contain toxic organic and metal pollutants zero discharge has also been promulgated as the BAT limitation. No additional cost beyond BPT will be required. The BPT model costs are presented in Tables VIII-4 and VIII-5.

C. Cost Required to Achieve the BCT Limitations

The BCT limitations for both types of cold worked pipe and tube plants are equal to the corresponding BPT limitations. Therefore, no additional costs beyond BPT will be incurred.

D. Costs Required to Achieve NSPS and PSNS

New source performance standards and pretreatment standards for new sources apply to those facilities which are constructed after the proposal of these standards. NSPS and PSNS for pipe and tube operations using water have been established at zero discharge. On a model plant basis, the estimated capital cost of NSPS and PSNS technology is $0.50 million. The corresponding annual cost is approximately $0.06 million.

The Agency considered two alternative treatment systems for plants using soluble oil solutions. The first alternative is identical to the corresponding BPT model treatment system. On a model plant basis, the estimated capital cost of NSPS and PSNS technology is $0.42 million, while the annual cost is approximately $0.06 million. The second alternative is discussed in Section XII. The corresponding model costs for this alternative are presented in Table VIII-5. The total capital cost for this alternative is $0.66 million and the annual cost is $0.09 million.

E. Costs Required to Achieve PSES

For the reasons set out in Section XIII, the Agency is establishing pretreatment standards at zero discharge. The model treatment costs are presented in Tables VIII-4 and VIII-5 for mills using water and oil, respectively. Since there are no existing cold worked pipe and tube operations using oil that discharge to POTWs, there are no industry-wide costs for PSES.

For those operations using water and discharge to POTWs the total capital expenditures are $0.09 million all of which is in-place as to July 1981. The annual costs associated with these capital expenditures amount to $0.01 million.

Energy Impacts

Moderate amounts of energy are required by the various levels of treatment for cold worked pipe and tube operations. All of the energy expenditures occur at the BPT treatment level for those plants using water and for those plants using soluble oil solutions which dispose of wastewaters by contract hauling. For new plants using oil, which treat wastewaters rather than haul off-site, the major energy expenditures will occur at the NSPS and PSNS levels of treatment.

A. Energy Impacts at BPT

The estimated energy requirements are based upon the assumption that treatment systems similar to the treatment models presented in this report are installed. On this basis, the energy use for the BPT model treatment system for all pipe and tube plants using water is estimated at 104,000 kilowatt-hours of electricity per year. Similarly, the energy use for the BPT model treatment system for all pipe and tube plants using soluble oil solutions is estimated at 152,000 kilowatt-hours of electricity per year. Both estimates are insignificant compared to the 57 billion kilowatt-hours used by the steel industry in 1978.

B. Energy Impacts at BAT

As the BAT alternative treatment system for pipe and tube plants using water and those using soluble oil solutions are identical to the corresponding BPT model treatment systems, no energy expenditures in excess of those incurred at BPT are required.

C. Energy Impacts at BCT

As the BCT alternative treatment systems for mills using water and mills using oil are identical to the corresponding BPT models, no energy expenditures in excess of those incurred at BPT are required.

D. Energy Impacts at NSPS and PSNS

The Agency did not estimate the subdivision-wide energy impacts for NSPS and PSNS since a determination of the number of new pipe and tube plants which will be installed in the future was not made as part of this study.

For those pipe and tube plants using water, NSPS is zero discharge. The model treatment system is identical to the BPT model treatment system for mills using water. On a model plant basis, this treatment model will use 8,000 kilowatt-hours of electricity per year.

For those pipe and tube plants using soluble oil solutions, the energy requirements for the two NSPS/PSNS alternatives are:

Model	kw-hr per year
NSPS and PSNS 1	8,000
NSPS and PSNS 2	44,000

E. Energy Impacts at PSES

For pipe and tube plants using soluble oil solutions, the PSES energy requirements (on a model plant basis) would be 8000 kilowatt-hours per year. The energy usage for pipe and tube plants using water is the same. Based upon these model energy requirements, it is estimated that 16,000 kilowatt-hours of energy will be expended by those operations using water. No energy will be required by those operations using oil since there are no operations discharging to POTWs.

Non-water Quality Impacts

In general, the Agency expects that the non-water quality impacts associated with the alternative treatment systems will be minimal. The three impacts evaluated are air pollution, solid waste disposal, and water consumption.

A. Air Pollution

No air pollution impacts are expected to occur for cold worked pipe and tube mills as a result of the installation of the treatment models.

B. Solid Waste Disposal

The treatment steps included in the BPT model treatment systems will generate quantities of solids and oils and greases. A summary of the solid waste generation for all pipe and tube operations at the BPT level of treatment follows.

Treatment Level	Solid Waste Generation Cold Worked Pipe and Tube Plants (Tons/Year)
BPT Using Water	1,820
BPT Using Soluble Oils	7,980

The BAT level of treatment for cold worked pipe and tube plants will not generate additional solid waste beyond the quantity generated at BPT.

PSES for both types of cold worked pipe and tube plants have been set at zero discharge. The model pretreatment systems will generate 140 and 420 tons/year of solid waste for operations using water and oil, respectively.

The estimated amounts of solid wastes generated by the NSPS and PSNS model treatment systems for cold worked pipe and tube mills are as follows:

Treatment Level	Solid Waste Generation Treatment Model (Tons/Year)
NSPS and PSNS (using water)	140
NSPS and PSNS 1 (using oil)	420
NSPS and PSNS 2 (using oil)	480

C. Water Consumption

No significant water consumption is expected to occur for cold worked pipe and tube mills as a result of the installation of the treatment systems considered by the Agency.

Summary of Impacts

The Agency concludes that the effluent reduction benefits described below for the cold worked pipe and tube subdivision outweigh the adverse impacts associated with energy consumption, air pollution, solid waste disposal, or water consumption.

	Direct Dischargers Effluent Loads (Tons/Year)	
	Raw Waste	BPT/BCT/BAT
Using Water		
Flow, MGD	19.2	0
TSS	522	0
Oil & Grease	1,357	0
Toxic Metals	6.8	0
Toxic Organics	0	0
Using Soluble Oil Solutions		
Flow, MGD	24.5	0
TSS	26,546	0
Oil & Grease	2,654,638	0
Toxic Metals	220	0
Total Organics	20.4	0

Indirect Dischargers
Effluent Loads (Tons/year)

Using Water	Raw Waste	PSES
Flow, MGD	3.0	0
TSS	80.3	0
Oil & Grease	209	0
Toxic Metals	1.0	0
Toxic Organics	0	0

The Agency also concludes that the effluent reduction benefits associated with compliance with new source standards (NSPS, PSNS) outweigh the adverse energy and non-water quality environmental impacts.

TABLE VIII-1

EFFLUENT TREATMENT COSTS
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)

(All costs are expressed in July, 1978 dollars)

Reference No.	0240B
Initial Investment Cost	13,390
Annual Costs	
Cost of Capital	1,340
Depreciation	670
Operation and Maintenance	235
Energy, Power, Chemicals, etc.	35
Other	210
TOTAL	2,490
$/Ton	1.93

Note: All cost values were taken from the D-DCP.

TABLE VIII-2

CONTROL AND TREATMENT TECHNOLOGIES
COLD FORMING SUBCATEGORY
COLD WORKED-PIPE AND TUBE
(USING WATER)

C & TT Step	Description	Implementation Time (Months)	Land Usage (ft^2)
A	SCALE PIT WITH CLAM SHELL - provides for primary settling of suspended particles. Settled solids are removed by clam shell	6-8	625
B	SURFACE SKIMMER - removes floating oils and greases from the wastewater surface.	3	No additional land required
C	RECYCLE - returns the wastewater to the process.	12-14	625

TABLE VIII-3

CONTROL AND TREATMENT TECHNOLOGIES
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
(USING SOLUBLE OILS)

C & TT Step	Description	Implementation Time (Months)	Land Usage (ft^2)
A	SCALE PIT WITH CLAM SHELL - provides for primary settling of suspended particles. Settled solids are removed by clam shell.	6-8	625
B	SURFACE SKIMMER - removes floating tramp oils and greases from the wastewater surface.	3	No additional land required
C	RECYCLE - returns virtually all the wastewater to the process.	12-14	625
D	STORAGE TANK AND CONTRACTOR REMOVAL - spent oil solutions are stored and hauled off-site as required.	6-8	400
E	EQUALIZATION TANK - collects and stores the wasteload for future batch treatment.	*	*
F	ACID ADDITION - acid is added to a reactor vessel to break the oil emulsion.	*	*
G	ALUM ADDITION - alum is used in conjunction with Step E to aid in breaking the oil emulsions.	*	*
H	LIME ADDITION - lime neutralizes the wastes in the flocculator mixing tank.	*	*
I	POLYMER ADDITION - polymer is added to the waste solution in conjunction with Step G to promote settling.	*	*
J	AIR FLOTATION - forces suspended and oily materials to rise to the surface where they can be removed from the wastewater.	*	*

TABLE VIII-3
CONTROL AND TREATMENT TECHNOLOGIES
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
(USING SOLUBLE OILS)
PAGE 2

K	SETTLING BASIN - additional suspended solids reduction is accomplished.	*	*
L	FILTRATION - effluent from Step J is passing through a filtration unit to further reduce suspended matter.	*	*

---

*: Since the wasteload is so small, implementation time and land usage for Steps E through L have been combined. They total approximately one year and 2500 ft^2.

TABLE VIII-4

BPT/BAT/PSES/PSNS/NSPS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Cold Forming
Subdivision : Cold Worked Pipe and Tube
: Using Water

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	Total
Investment ($ x 10^{-3})	106.0	20.0	372.0	498.0
Annual Costs ($ x 10^{-3})				
Capital	9.5	1.8	33.4	44.7
Operation & Maintenance	3.7	0.7	13.0	17.4
Land	0.1(1)			0.1(1)
Sludge Disposal	0.7			0.7
Hazardous Waste Disposal				
Oil Disposal		1.4		1.4
Energy & Power		0.2		0.2
Steam				
Waste Acid				
Crystal Disposal				
Chemical				
TOTAL	14.0	4.1	46.4	64.5
Credits				
Scale				
Sinter				
Oil				
Acid Recovery				
TOTAL CREDITS				
NET TOTAL	14.0	4.1	46.4	64.5

---

(1) Total land requirement for model

KEY TO C&TT STEPS

A: Scale Pit
B: Oil Skimming
C: Recycle

TABLE VIII-5

BPT/BAT/PSES/PSNS/NSPS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Subdivision: Cold Worked Pipe & Tube
: Using Oil

Model Size-TPD : 270
Oper. Days/Year: 260
Turns/Day : 3

	BPT/BAT/PSES/PSNS/NSPS Alternative 1					PSNS/NSPS Alternative 2 Components A,B, & C Plus:			
C&TT Step	A	B	C	D	Total	E	F	G	H
Investment ($ x 10^{-3})	87.0	17.0	309.0	11.0	424.0	29.0	33.0	32.0	34.0
Annual Costs ($ x 10^{-3})									
Capital	7.8	1.5	27.8	1.0	38.1	2.6	3.0	2.9	3.1
Operation & Maintenance	3.0	0.6	10.8	0.4	14.8	1.0	1.2	1.1	1.2
Land	0.1				0.1				
Sludge Disposal	2.1				2.1				
Hazardous Waste Disposal									
Oil Disposal				0.3	0.3				
Energy & Power		0.2			0.2	0.1	0.1	0.1	0.1
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	13.0	2.3	38.6	1.7	55.6	3.7	4.3	4.1	4.4
Credits									
Scale									
Sinter									
Oil									
Acid Recovery									
TOTAL CREDITS									
NET TOTAL	13.0	2.3	38.6	1.7	55.6	3.7	4.3	4.1	4.4

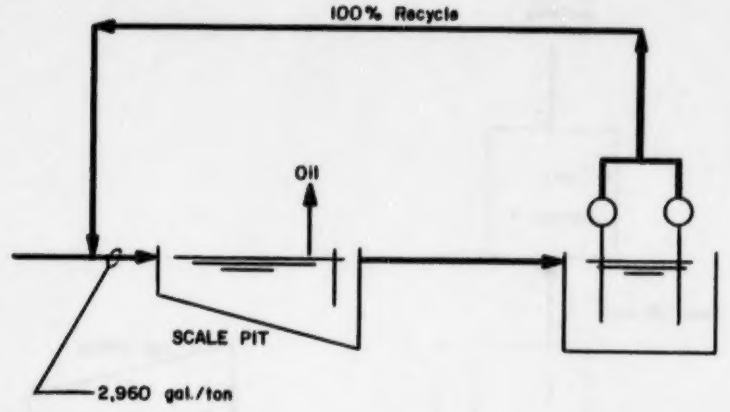
TABLE VIII-5
BPT/BAT/PSES/PSNS/NSPS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	PSNS/NSPS Alternative 2 (Continued)				
	I	J	K	L	Total
Investment ($ x 10^{-3})	36.0	33.0	11.0	44.0	665.0
Annual Cost ($ x 10^{-3})					
Capital	3.2	3.0	1.0	4.0	59.9
Operation & Maintenance	1.3	1.2	0.4	1.5	23.3
Land			0.1		0.2
Sludge Disposal		0.3			2.4
Hazardous Waste Disposal					
Oil Disposal		0.3			0.3
Energy & Power	0.2	0.2		0.1	1.1
Steam					
Waste Acid					
Crystal Disposal					
Chemical					
TOTAL	4.7	5.0	1.5	5.6	87.2
Credits					
Scale					
Sinter					
Oil					
Acid Recovery					
TOTAL CREDITS					
NET TOTAL	4.7	5.0	1.5	5.6	87.2

KEY TO C&TT STEPS

A: Scale Pit
B: Surface Skimming
C: Recycle
D: Storage and Contract Hauling
E: Equalization
F: Acid Addition
G: Flocculation with Alum
H: Flocculation with Lime
I: Flocculation with Polymer
J: Gas Flotation
K: Settling
L: Pressure Filtration

BPT/BAT/BCT/PSES/PSNS/NSPS

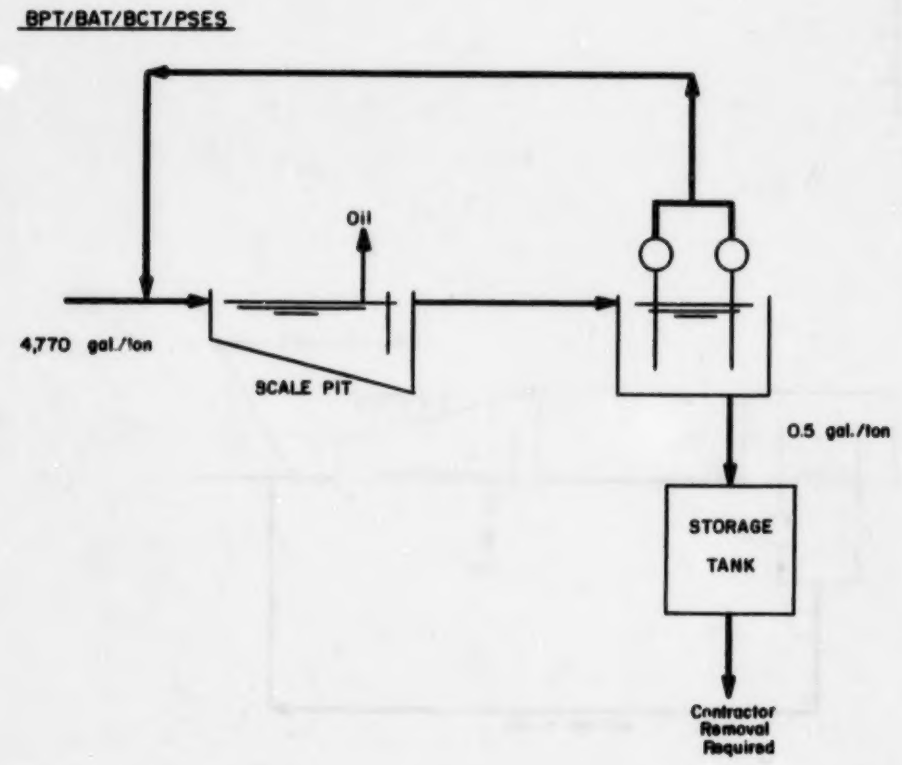

100% Recycle
Oil
SCALE PIT
2,960 gal./ton

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
USING WATER
BPT/BAT/BCT/PSES/PSNS/NSPS MODELS

Dwn. 12/1/81

FIGURE VIII-1

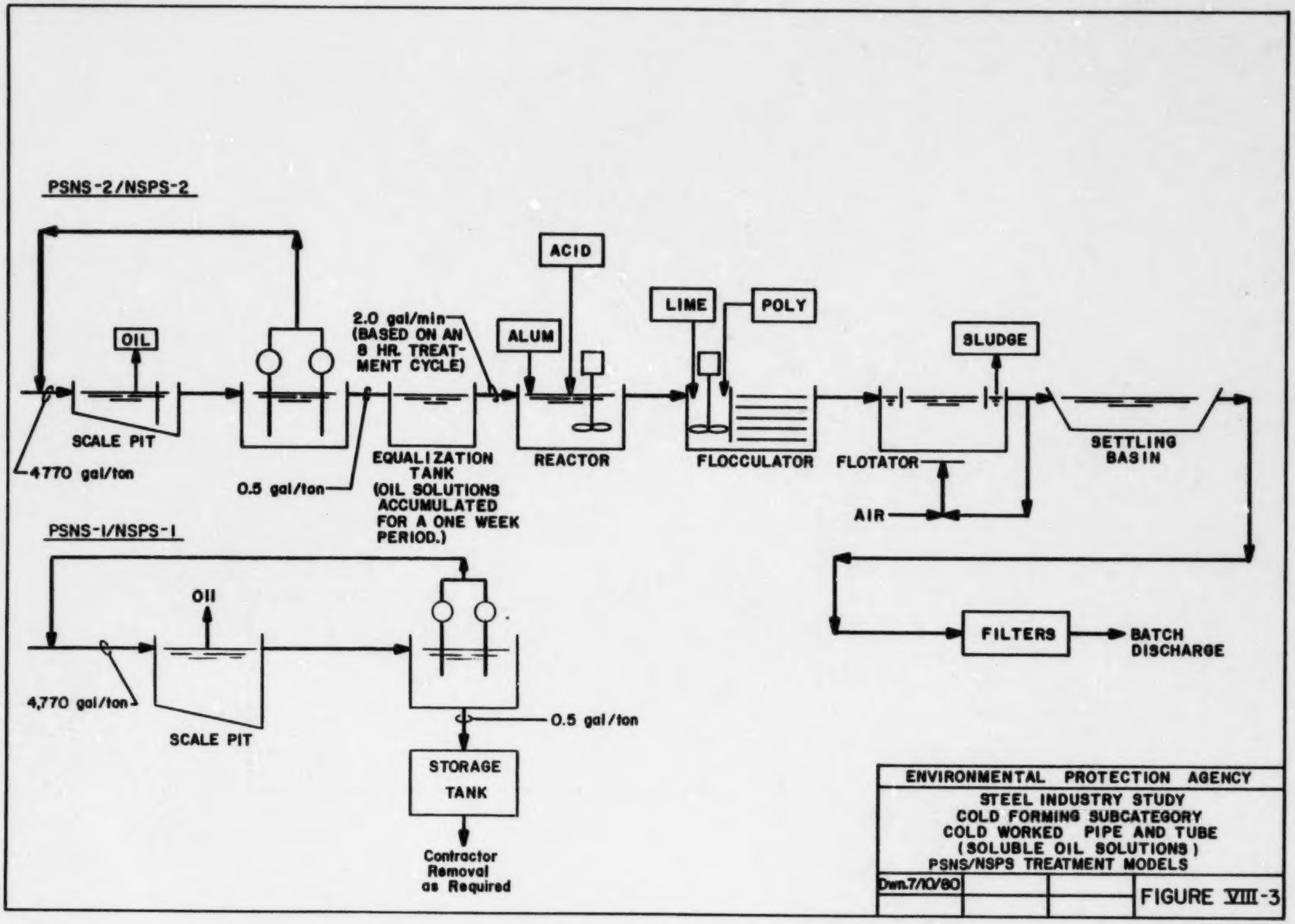

BPT/BAT/BCT/PSES
Oil
4,770 gal./ton
SCALE PIT
0.5 gal./ton
STORAGE TANK
Contractor Removal Required

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
SOLUBLE OIL SOLUTIONS
BPT/BAT/BCT/PSES MODELS

Dwn.12/8/81

FIGURE VIII-2


PSNS-2/NSPS-2
OIL
SCALE PIT
4770 gal/ton
0.5 gal/ton
2.0 gal/min (BASED ON AN 8 HR. TREATMENT CYCLE)
EQUALIZATION TANK (OIL SOLUTIONS ACCUMULATED FOR A ONE WEEK PERIOD.)
ALUM
ACID
REACTOR
LIME
POLY
FLOCCULATOR
FLOTATOR
AIR
SLUDGE
SETTLING BASIN
FILTERS
BATCH DISCHARGE
PSNS-1/NSPS-1
Oil
4,770 gal/ton
SCALE PIT
0.5 gal/ton
STORAGE TANK
Contractor Removal as Required
Dwn.7/10/80

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
(SOLUBLE OIL SOLUTIONS)
PSNS/NSPS TREATMENT MODELS

FIGURE VIII-3

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

Introduction

Upon reevaluation of pipe and tube operations, the Agency has concluded that the Best Practicable Control Technology Currently Available (BPT) limitations originally promulgated for the pipe and tube subcategory are not appropriate for cold worked pipe and tube operations. As explained previously, the original limitations were developed based primarily upon hot forming pipe and tube operations. The BPT limitations for cold worked pipe and tube operations are reviewed below.

Identification of BPT

Based upon the information contained in Sections III through VIII of this report, the BPT model treatment systems for the cold worked pipe and tube subdivision are as follows.

A. Cold Worked Pipe and Tube Plants Using Water

The BPT model treatment system includes settling of the raw wastewater in a primary scale pit equipped with oil skimming equipment. All of the treated wastewater is then recycled to the process. This system achieves zero wastewater discharge and is illustrated in Figure-IX-1. Forty percent of the water solution plants reporting flow data achieve zero discahrge.

B. Cold Worked Pipe and Tube Plants Using Soluble Oil Solutions

The BPT model treatment system includes settling of the raw waste solution in a primary scale pit equipped with oil skimming equipment which removes tramp oils. Nearly all of the solution is then recycled to the process. The spent solution is periodically removed by a contract hauler so that there is no discharge to navigable waters. Ninety-five percent of those mills using oil solutions achieve zero discharge. The treatment system described is illustrated in Figure IX-2.

The Agency considered treatment and discharge (to navigable waters) of the blowdown (0.5 gal/ton) from mills using oil solutions. The treatment considered consists of batch treatment on a weekly basis in a dissolved air flotation sytstem. The capital and annual costs (see NSPS discussions in Sections VIII and XII) for this system significantly exceeded the cost for disposal by contract hauling. For this reason, and the fact that zero discharge is achieved at 95% of the plants in the industry (79% by contract hauling), the Agency decided not to establish the BPT model treatment system on the basis of treatment and discharge.

The BPT limitations do not require the installation of the model treatment systems. Any treatment which achieves the limitations is acceptable.

Rationale for BPT Treatment Systems

As noted in Section VII, each of the components in the BPT model treatment systems is demonstrated at a number of cold worked operations.

Justification of the BPT Limitations

The BPT limitation for cold worked pipe and tube plants using water is zero discharge. Demonstration of the achieveability of this limitation is presented in Table IX-1.

The discharge flow of 0.5 gal/ton, from cold worked pipe and tube plants using soluble oils, is periodically hauled off-site for disposal, so there is no discharge from cold worked operations to navigable waters. Approximately 79% of the cold worked pipe and tube plants using soluble oils presently have spent oil solutions hauled off-site for disposal. An additional 16% achieve zero discharge by other means, e.g., land application of the spent oil solutions. Incineration is another method of disposing of spent oil solutions which achieves the zero discharge limitation. A list of those oil operations achieving the BPT limitation (zero discharge) is presented in Table IX-2.

TABLE IX-1

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
(USING WATER)

BPT Effluent Limitations - - - - - - - - Zero Discharge

Mills Achieving Limitations	Basis
0256F (04-06)*	Visit
0060P (01-09)	DCP
0908	DCP
0908A (01-02)	DCP

---

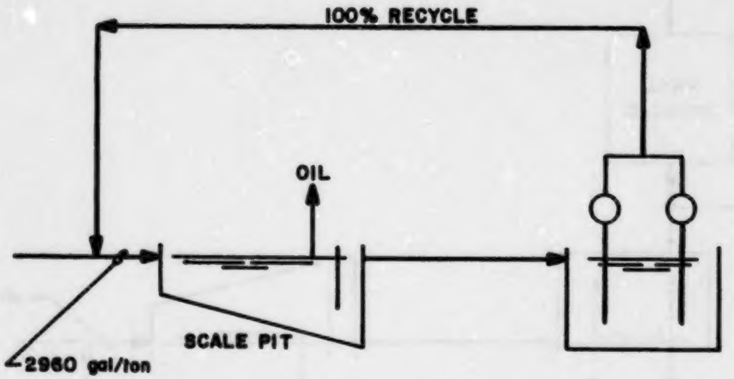
* Sampled Plant Code 331A

TABLE IX-2

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
(USING OIL SOLUTIONS)

BPT Effluent Limitations - - - - - - - - - Zero Discharge

Mills Achieving Limitations	Sampled Plant Code	Basis
0060		DCP
0080A (01-03)		DCP
0240B (01-05)	338	Visit
0240C (01-04)		DCP
0256F (01-03)	331B	Visit
0432A (05)		DCP
0548C (01-03)		Visit
0636 (01-04)		DCP
0648K (01-15)		DCP
0684L (01-04)	332	Visit
0684M (01-06)		DCP
0684N (01-08)		DCP
0684W (01-02)		DCP
0856N	335	Visit
0856Q	336B	Visit
0916A (02)		DCP

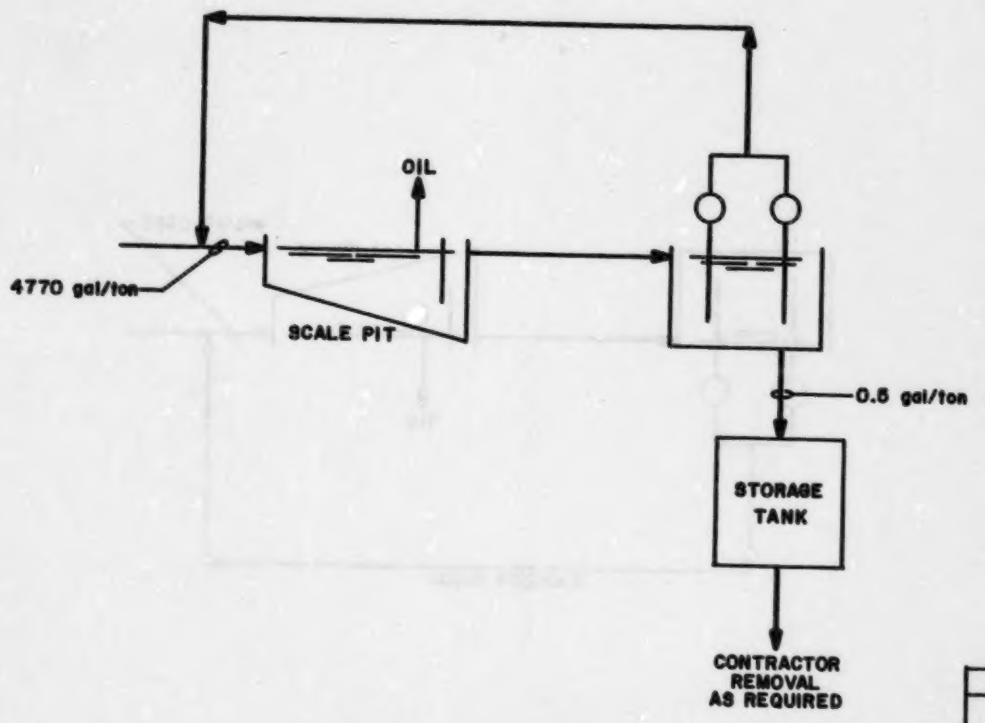

100% RECYCLE
OIL
SCALE PIT
2960 gal/ton

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
(USING WATER)
BPT TREATMENT MODEL

Dwn.7/10/80

FIGURE IX - 1


4770 gal/ton
OIL
SCALE PIT
0.5 gal/ton
STORAGE TANK
CONTRACTOR REMOVAL AS REQUIRED

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE
(SOLUBLE OIL SOLUTIONS)
BPT TREATMENT MODEL
Dwn.7/10/80

FIGURE IX - 2

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

The Best Available Technology Economically Achievable (BAT) effluent limitations are to be attained by July 1, 1984. BAT is determined by reviewing subcategory practices and identifying the best economically achievable control and treatment technologies employed within the subcategory. In addition, a technology that is readily transferable from another subcategory or industry may be identified as BAT.

Since toxic metals are present in significant quantities in wastewaters from cold worked pipe and tube mills using water, the Agency has also estalished BAT at zero discharge. This is the same as the BPT limitation. The model treatment system is illustrated in Figure IX-1.

Toxic organic and toxic metal pollutants are present in significant quantities in wastewaters from cold worked pipe and tube mills using oil. The Agency has, therefore, established BAT as zero discharge which is the same as the BPT limitation. In the BAT (BPT) model treatment system for the cold worked pipe and tube plants using soluble oil solutions (Figure IX-2), most of the waste solution is recycled, with a small amount collected by contract haulers for off-site disposal. Disposal of these waste solutions could also be accomplished through incineration.

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

Introduction

The 1977 Amendments added Section 301(b)(2)(E) to the Act establishing "best conventional pollutant control technology" [BCT] for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(a)(4) [biochemical oxygen demanding pollutants (BOD5), total suspended solids (TSS), fecal coliform, and pH], and any additional pollutants defined by the Administrator as "conventional" (oil and grease, 44 FR 44501, July 30, 1979).

BCT is not an additional limitation but replaces BAT for the control of conventional pollutants. In addition to other factors specified in section 304(b)(4)(B), the Act requires that BCT limitations be assessed in light of a two part "cost-reasonableness" test. American Paper Institute v. EPA, 660 F. 2d 954 (4th Cir. 1981). The first test compares the cost for private industry to reduce its conventional pollutants with the costs to publicly owned treatment works for similar levels of reduction in their discharge of these pollutants. The second test examines the cost-effectiveness of additional industrial treatment beyond BPT. EPA must find that limitations are "reasonable" under both tests before establishing them as BCT. In no case may BCT be less stringent than BPT.

EPA published its methodology for carrying out the BCT analysis on August 29, 1979 (44 FR 50732). In the case mentioned above, the Court of Appeals ordered EPA to correct data errors underlying EPA's calculation of the first test, and to apply the second cost test. (EPA had argued that a second cost test was not required.)

BCT Limitations

The BCT model treatment system for cold worked pipe and tube plants using water, (illustrated in Figure IX-1), achieves zero discharge by recycling 100% of the process water. In the BCT model treatment system, for cold worked pipe and tube plants using soluble oil solutions, (illustrated in Figure IX-2) the spent oil solutions are hauled off-site. Thus, there is no discharge of wastewaters.

Because the BPT limitations for these operations are zero discharge, the Agency has established the BCT limitations at zero discharge. Accordingly, there are no additional costs incurred for compliance with the BCT limitation over that for BPT.

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COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS

Introduction

The effluent standards which must be achieved by new sources specify the degree of effluent reduction achievable through the application of the Best Available Demonstrated Control Technology (BDT), including, where applicable, a standard permitting no discharge of pollutants. This section identifies the alternatives considered for NSPS and the resulting effluent levels for cold worked pipe and tube operations. In addition, the rationale for selection of the NSPS treatment systems, flow values, and effluent standards are presented.

Identification of NSPS

Pipe and Tube Plants Using Water

The NSPS model treatment system for plants using water is identical to the BPT model treatment system corresponding to those same plants. This system, which is illustrated in Figure IX-1, consists of a scale pit, oil skimmer, and recycle mechanism. As this is a total recycle system, there is no discharge.

Pipe and Tube Plants Using Soluble Oil Solutions

A. NSPS Alternative 1

The first NSPS alternative treatment system considered for plants using oil solutions is identical to the BPT model treatment system. This system, which is illustrated in Figure IX-2, consists of a scale pit, oil skimmer, and recycle mechanism. The entire process flow, except for 0.5 gal/ton, is recycled to the process. The 0.5 gal/ton of spent oil solution is sent to a storage tank. The solutions are removed from the tank by contract hauler as required. Thus there is no discharge from cold worked operations with this alternative

B. NSPS Alternative 2

In response to industry comments, an NSPS alternative incorporating treatment and discharge of the oil solution blowdown was considered by the Agency (Figure VIII-3). In this alternative, the oil solutions pass through a scale pit with an oil skimmer. Most of the oil is recycled to the process with 0.5

gal/ton directed to an equalization and storage tank, with a one week detention time. The spent oils are treated in a batch treatment system on a weekly basis. The flow rate through the batch treatment system is only 2.0 gal/min for an eight hour treatment cycle . The first component in this batch treatment system is a reactor into which acid and alum are added. These chemicals are added to break the oil emulsions. Lime and polymer/polyelectrolyte are then introduced in a flocculator. The lime neutralizes the solution, while the polymer/polyelectrolyte is used to coagulate the oils and suspended solids. The wastewaters are then treated in an air flotation unit to remove the suspended and oily meterial. The floated wastes are skimmed off the surface and the heavier sludge is drawn off the bottom of the flotation unit. The treated effluent is then discharged to a receiving stream. This alternative treatment system is commonly used in this and other industries to treat oily wastes. The technology is used as the BPT (BCT and BAT) model treatment system for the cold rolling subdivision of the cold forming subcategory.

Rationale for Selection of NSPS

Treatment Systems

The NSPS alternative treatment systems considered for cold worked pipe and tube operations are presently in use in this subdivision or commonly used at similar operations in other cold worked metals manufacturing processes.

Flows

The applied and discharge flows (zero discharge) developed for these NSPS models are representative of actual flows found in cold worked pipe and tube plants. Process information provided by the industry for these plants was used in developing the average values. The attainment of zero discharge in this subdivision is well demonstrated as discussed in Section IX.

Selection of NSPS Alternative

Pipe and Tube Plants Using Water

There is only one NSPS treatment system considered, which is a zero discharge system. Zero discharge is also established at BPT and BAT, and is well demonstrated. That system is illustrated in Figure IX-1.

Pipe and Tube Plants Using Oil

Alternative 1, which is also based upon zero discharge, is the selected NSPS alternative for plants using soluble oil solutions. The NSPS model treatment system is illustrated in Figure IX-2. This alternative was selected because zero discharge is achieved at 95% of the existing oil solution plants. This requirement is also established at BPT and BAT. Moreover, the capital and annual costs associated with this model treatment system is significantly less than the costs for Alternative 2, which is based on treatment and discharge of the spent oil solutions.

Demonstration of NSPS

Tables IX-1, for water, and IX-2, for oil, present lists of those plants that demonstrate NSPS for cold worked pipe and tube operations.

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION XIII

PRETREATMENT STANDARDS FOR COLD WORKING PIPE AND TUBE OPERATIONS DISCHARGING TO PUBLICLY OWNED TREATMENT WORKS

Introduction

This section presents pretreatment alternatives for cold worked pipe and tube operations with discharges to publicly owned treatment works (POTWs). Consideration has been given to the pretreatment of cold worked process waste solutions from new sources (PSNS) and from existing sources (PSES).

General Pretreatment Standards

For detailed information on Pretreatment Standards refer to 46 FR 9404 et seq, "General Pretreatment Regulations for Existing and New Sources of Pollution," (January 28, 1981). See also 46 FR 4518 (February 1, 1982). In particular, 40 CFR Part 403 describes national standards (prohibited discharges and categorical standards), revision of categorical standards, and POTW pretreatment programs.

In establishing pretreatment standards for cold worked pipe and tube operations, the Agency considered the objectives and requirements of the General Pretreatment Regulations. The Agency determined that uncontrolled discharges of cold worked pipe and tube wastewaters to POTWs would result in pass through of toxic pollutants.

Identification of Pretreatment Alternatives

A. Pipe and Tube Plants Using Water

Available data demonstrate that many cold worked operations using water have total recycle systems, while very few discharge to POTWs. Toxic metal pollutants are found in significant quantities in these wastewaters. As a result the Agency has promulgated PSES and PSNS as zero discharge, which is the same as BAT. As shown is Section IX the achievability of this standard is well demonstrated.

B. Pipe and Tube Plants Using Soluble Oil Solutions

Waste oil solutions from most plants are currently hauled off-site for disposal by contractors. None of these plants discharge spent oil solutions to a POTW. To insure that these solutions, which may contain large quantities of toxic organic

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and metal pollutants and emulsified oils not treatable by municipal systems, do not pass through POTWs, a zero discharge standard has been promulgated for these operations. This requirement is the same as that established at BAT. As shown in Section IX the achieveability of this standard is well demonstrated.

For PSNS the Agency evaluated a second alternative pretreatment system which is identical to NSPS Alternative 2. In this alternative a discharge is allowed. However, the Agency did not select this alternative since the selected zero discharge alternative is feasible and well demonstrated. In addition, the zero discharge alternative requires less capital and annual costs. This is discussed in more detail in Section XII.

The removal of toxic metal pollutants for the selected PSES and PSNS alternatives are compared to POTW removal rates for these metals:

	PSES/PSNS	POTW
Copper	100%	58%
Nickel	100%	19%
Zinc	100%	65%

As shown above, the selected PSES and PSNS Alternatives will prevent pass through of toxic metals at POTWs compared to untreated discharges of cold worked pipe and tube wastewaters to POTWs. The achievability of these standards is reviewed in Sections IX and X. The model treatment system is depicted in Figure XIII-1 and the PSES and PSNS are presented in Table XIII-1.

ALKALINE CLEANING SUBCATEGORY

SECTION I

PREFACE

The USEPA has promulgated effluent limitations and standards for the steel industry pursuant to Sections 301, 304, 306, 307 and 501 of the Clean Water Act. The regulation contains effluent limitations guidelines for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS).

This part of the Development Document highlights the technical aspects of EPA's study of the Alkaline Cleaning Subcategory of the Iron and Steel Industry. Volume I of the Development Document addresses general issues pertaining to the industry, while other volumes contain specific subcategory reports.

ALKALINE CLEANING SUBCATEGORY

SECTION II

CONCLUSIONS

Based upon information and data obtained during this study and previous studies, and information obtained during the public comment period, the Agency has reached the following conclusions.

1. Untreated alkaline cleaning wastewaters do not contain significant levels of toxic, conventional, or nonconventional pollutants. However, since these wastewaters are co-treated with other steel finishing wastewaters, the Agency has promulgated BPT limitations for alkaline cleaning operations for total suspended solids, oil and grease, and pH that are consistent with the BPT limitations for these pollutants for steel finishing operations. Since the BPT level of treatment provides adequate controls, the Agency has not promulgated more stringent BAT limitations. In addition, the Agency has not established pretreatment standards for new and existing sources.

2. Alkaline cleaning operations are conducted on both a batch and continuous basis. The Agency believes that it is appropriate to subdivide the subcategory on that basis for existing sources (BPT and BCT). However, the Agency has determined that the same effluent flow rates and effluent quality can be achieved for both batch and continuous new source operations, and NSPS were promulgated on that basis.

3. The model treatment system used as the basis for the BPT limitations promulgated in 1976 for alkaline cleaning operations has not been changed. The model treatment system consists of equalization, oil separation, polymer and acid addition and sedimentation. Sludges are dewatered with vacuum filters. This model treatment system is consistent with the model treatment systems for other finishing operations.

4. The Agency has not promulgated effluent limitations and standards for dissolved chromium, nickel, and iron. These pollutants were limited in the originally promulgated BPT regulation. Data gathered for this study demonstrate that these pollutants are found only at low concentrations in untreated alkaline cleaning wastewaters.

5. Based upon facilities in place as of July 1981, the Agency estimates the following costs will be incurred by the industry to bring alkaline cleaning operations into compliance with the BPT limitations:

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Costs (Millions of July 1, 1978 Dollars)

	Investment Costs			Annual Costs		
	Total	Required	In-Place	Total	Required	In-Place
BPT	$12.3	$ 0.6	$11.7	$1.7	$0.1	$1.6

These costs are based upon more costly separate treatment of alkaline cleaning wastewaters, although central treatment of alkaline cleaning wastewaters is practiced throughout the industry.

6. The Agency has promulgated BCT effluent limitations for alkaline cleaning operations that are identical to the BPT effluent limitations. No additional treatment beyond BPT is required.

7. The Agency has promulgated NSPS for alkaline cleaning operations based upon best demonstrated flows and the BPT model treatment system effluent quality.

8. With respect to the "remand issues," the Agency has reached the following conclusions.

    a. The ages of alkaline cleaning lines do not affect the ease or cost of retrofitting pollution control equipment. Thus, less stringent effluent limitations and standards were not promulgated for "older" alkaline cleaning lines.

    b. The Agency examined the consumptive use of water resulting from compliance with the effluent limitations and standards. Since evaporative cooling systems are not included in any of the model treatment systems, compliance with these requirements will result in little or no consumption of water.

9. Table II-1 presents the treatment model flow, effluent quality data, and the BPT effluent limitations for the alkaline cleaning subcategory. Table II-2 presents the treatment model flow, effluent quality data, and the BCT effluent limitations and NSPS for the alkaline cleaning subcategory.

TABLE II-1

BPT MODEL FLOW, EFFLUENT QUALITY AND EFFLUENT LIMITATIONS ALKALINE CLEANING SUBCATEGORY

Pollutant	Treatment Model Effluent Quality (1)		Effluent Limitations (kg/kkg of Product)	
	Daily Maximum Concentration	30-Day Average Concentration	Daily Maximum Limitations	30-Day Average Limitations
Batch				
Flow, gal/ton	250		NA	
pH, Units	6.0 to 9.0		6.0 to 9.0	
Oil and Grease	30	10	0.0313	0.0104
TSS	70	30	0.0730	0.0313
Continuous				
Flow, gal/ton	350		NA	
pH, Units	6.0 to 9.0		6.0 to 9.0	
Oil and Grease	30	10	0.0438	0.0146
TSS	70	30	0.102	0.0438

NA: Not applicable

(1) Concentrations are expressed in mg/1 unless otherwise noted.

TABLE II-2

TREATMENT MODEL FLOWS, EFFLUENT QUALITY AND EFFLUENT LIMITATIONS AND STANDARDS
ALKALINE CLEANING SUBCATEGORY

Pollutant	BCT Treatment Model Effluent Quality(1)		BAT(3) Effluent Limitations	BCT Effluent Limitations(3)	
	Daily Maximum Concentration	30-Day Average Concentration		Daily Maximum Limitation	30-Day Average Limitation
Batch					
Flow, gal/ton	250		(2)	NA	
pH, Units	6.0 to 9.0			6.0 to 9.0	
Oil and Grease	30	10		0.0313	0.0104
TSS	70	30		0.0730	0.0313
Continuous					
Flow, gal/ton	350		(2)	NA	
pH, Units	6.0 to 9.0			6.0 to 9.0	
Oil and Grease	30	10		0.0438	0.0146
TSS	70	30		0.102	0.0438

Pollutant	NSPS Treatment Model Effluent Quality(1)		NSPS(3)		PSES(3)	PSNS(3)
	Daily Maximum Concentration	30-Day Average Concentration	Daily Maximum Standards	30-Day Average Standards		
Batch						
Flow, gal/ton	50		NA		(4)	(4)
pH, Units	6.0 to 9.0		6.0 to 9.0			
Oil and Grease	30	10	0.00626	0.00209		
TSS	70	30	0.0146	0.00626		
Continuous						
Flow, gal/ton	50		NA		(4)	(4)
pH, Units	6.0 to 9.0		6.0 to 9.0			
Oil and Grease	30	10	0.00626	0.00209		
TSS	70	30	0.0146	0.00626		

NA: Not applicable

(1) Concentrations are expressed in mg/l unless otherwise noted.
(2) No BAT limitations are currently proposed.
(3) kg/kkg of product
(4) Only the general pretreatment regulation applies.

ALKALINE CLEANING SUBCATEGORY

SECTION III

INTRODUCTION

General Discussion

Alkaline cleaning is that process in which steel products are cleaned prior to entering other finishing operations such as hot coating or electroplating. Although several cleaning solutions are used in the cleaning baths, most operations have similar operating and wastewater characteristics.

Since the cleaning solutions used for alkaline cleaning are not aggressive, high levels of pollutants are not generated. The most significant pollutants contributed by the process are suspended solids, oil and grease, and relatively low levels of some toxic metals. These pollutants originate in the alkaline cleaning bath and in the rinsing steps which usually follow the cleaning bath.

Almost all alkaline cleaning operations are included in larger steel finishing mills. For example, an alkaline cleaning operation may precede a pickling operation which may in turn precede a hot coating operation. While the entire steel finishing operation may be operated in an integrated manner, finishing operations have been subcategorized in such a way that appropriate effluent limitations could be established for each discrete operation. This procedure allows for consideration of plant-specific process configurations during the preparation of NPDES permits.

Alkaline cleaning operations are conducted in both the batch and continuous modes. These operations are illustrated in Figures III-1 and III-2 which also detail complete finishing operations (i.e., cleaning, pickling). The information developed and presented in this report applies only to alkaline cleaning operations.

Development of Limitations

Effluent limitations applicable to alkaline cleaning operations were previously promulgated on March 29, 1976 for total suspended solids, dissolved iron, dissolved chromium, dissolved nickel, and pH. For this study, the Agency conducted additional sampling and gathered detailed information from the steel industry to provide an expanded data base. The primary source of new information is the industry's response to the basic data collection portfolios (DCPs) which were sent to approximately 85% of the active alkaline cleaning operations in the United States. Information was provided for 176 alkaline cleaning operations through the DCP responses. The data for batch and continuous mills have been tabulated and summarized in Tables III-1 and III-2, respectively.

Detailed data collection portfolios (D-DCPs) were sent to selected operations to gather information on long-term effluent quality, cost information on the wastewater treatment systems installed, and the cleaning operation. Detailed data for twenty alkaline cleaning operations at three plant sites were solicited through D-DCPs. The responses provided data to verify cost estimates and to establish retrofit costs.

The previous limitations and standards for the alkaline cleaning subcategory were based solely upon data obtained through field sampling at one plant. The Agency determined that data obtained at that plant are not typical of alkaline cleaning wastewaters as the sampling occured during a dump of the alkaline cleaning bath. During this study, two additional lines were sampled, and the one line originally sampled was revisited. This sampling program increased the existing data base for the pollutants previously limited and provided data for other toxic pollutants as well. All alkaline cleaning operations sampled, with a basic description of each, are listed in Table III-3. As shown in Table III-3, Plant 0432K was sampled twice and designated as Plant I on the first visit and Plant 157 on the second visit. The updated data bases for this subcategory are presented in Tables III-4 and III-5.

Description of Alkaline Cleaning Operations

Alkaline cleaning is used where vegetable, mineral and animal fats and oils must be removed from the steel surface prior to further processing. Immersion in solutions of various compositions, concentrations, and temperatures is often used to achieve the cleaning process. Electrolytic cleaning may be used for large scale production or where a cleaner product is required. The alkaline cleaning bath is a solution or dispersion of carbonates, alkaline silicates and phosphates in water. Wetting agents are often added to the cleaning bath to facilitate cleaning.

TABLE III-1

SUMMARY TABLES
ALKALINE CLEANING - BATCH TYPE MILLS

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
060N-01	Pipe	SS	1970	5	42	42	CNT 3,1; NL; NW; SS; O(1)	1970	No
060N-02	Pipe	SS	1970	5	42	42	CNT 3,1; NL; NW; SS; O(1)	1970	No
068-01	Bar, Strip	CS	1934	39	1829(max)	1829(max)	Untreated to POTW	NA	Yes
068-03	Rod	CS	1937	1	236(6)	236(6)	Untreated to POTW; REU, 85	NA	Yes
088C-01	Tube	CS	1930	NA	NA(6)	NA(6)	Untreated to POTW	NA	Yes
088C-02	Tube	CS	1930	NA	NA(6)	NA(6)	Untreated to POTW	NA	Yes
088C-03	Tube	CS	1930	NA	NA(6)	NA(6)	Untreated to POTW	NA	Yes
088C-04	Tube	CS	1930	NA	NA(6)	NA(6)	Untreated to POTW	NA	Yes
088C-05	Tube	CS	1930	NA	NA(6)	NA	Untreated to POTW	NA	Yes
112C	Bar, Wire,Rod	NA	1914	NA	NA	NA	CNT 3, (UNK); NL; AE; CL; T	1977	No
112F	Wire	CS	1948	2	NA	NA	Rinses & Cleaner are hauled	NA	No
112I-02	Fasteners	CS	1951	38	NA	NA	CNT 3,5; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
112I-03	Fasteners	CS	1922	65	NA	NA	CNT 3,(UNK); NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
112I-04	Plate Washers, Slugs	CS	1970	146	[67]	[67]	CNT 3, 10; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
112I-05	Fasteners	CS	1970	4	NA	NA	CNT 3, 1; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
112I-06	Fasteners	CS	1970	44	NA	NA	CNT 3, (UNK); NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
112I-07	Fasteners	CS	1956	12	NA	NA	CNT 3, (UNK); NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
112I-08	Angles	CS	1962	16	NA	NA	CNT 3, (UNK); NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
112I-09	Fasteners	CS	1950	17	NA	NA	CNT 3, <1; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
112I-15	Forgings, Set Screws	CS	1968	12	NA	NA	CNT 3, 1; PSP; SS	Pre 1950	No
240B-01	Tubes	CS	1965	240	24	24	CNT 3, 9.3; NW; NL; AO; SS; T; VF; SL(UNK)	1968	No
240B-02	Tubes	CS	1974	102	28	28	CNT 3, 4.6; NW; NL; AO; SS; T; VF; SL(UNK)	1968	No
240B-03	Tubes	CS	1938	54	53	53	CNT 3, 4.6; NW; NL; AO; SS; T; VF; SL(UNK)	1968	No
240B-04	Tubes	CS	1954	3	NA	NA	CNT 3, 0.3; NW; NL; AO; SS: T; VF; SL(UNK)	1968	No
240C	Tubes	CS	1973	102	8	7	Rinses & Cleaner are hauled	NA	No
248C	Bar, Rod, Wire	SS	1973	13	NA	NA	CNT 3, <0.01; NC; AE; CL; T; VF; FLO(2), FLP;	1975	No

TABLE III-1
SUMMARY TABLES
ALKALINE CLEANING - BATCH TYPE MILLS
PAGE 2

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
256H-01	Bar	**	1965	**	**	**	CNT (UNK), 0.3; NA; then to POTW; 95% Treated, 5% Untreated	1973	Yes
256H-02	Shapes	**	1976	**	**	**	CNT (UNK), 0.7; NA; then to POTW; 95% Treated, 5% Untreated	1976	Yes
384A	Sheet, Strip	CS	1968	858	168	168	CNT(UNK) 0.45; SS; CL; FLL; FLA; FLP; FLO(4); Spent Cleaner hauled	1970	No
460D	Wire	CS	1959	55	275	275	CNT 3, 3.6; T; VF; NL; FLP; CL	1970	No
460G	Wire	CS	1969	19	270	270	CNT 3, 1.7; NO(3); SL(UNK)	1968	No
460H	Wire	CS	1957	42	170	170	Rinses Untreated to POTW; Cleaner is hauled	NA	Yes
476A	Rod, Wire	CS	1960	NA	NA	NA	CNT(UNK), (UNK); AE; SCR; SS; NL; FLP; CL; SL(UNK); Cleaner dumped 4/6 Mo.	1977	No
492A-01	Pipe	CS	1962	186	NA$^{(5)}$	NA$^{(5)}$	No Rinses(rinse with pickling line) Cleaner to acid pit.	NA	No
492A-02	Tube	CS	1970	288	NA$^{(5)}$	NA$^{(5)}$	No Rinses (rinse with pickling line) Cleaner to acid pit.	NA	No
548	Tube	CS	1927	23	961	961	CNT 3, 3; NL; SL	1969	No
548A	Pipe, Tube	CS	1957	15	NA	NA	CNT 3, (UNK); NC; NW; SL(UNK)	1967	No
548B-01	Tube	CS	1947	46	216	216	Untreated to POTW	NA	Yes
548B-02	Tube	SS	1947	2	1290	1290	Untreated to POTW	NA	Yes
580A-03	Wire	CS	1962	4	1951	1951	CNT 3, 1.7; F(Unk) (Unk)P; NL; NW; Cleaner - CR then with rinse, RET 25	1967	No
580G-01	Wire	CS	1971	2	600	600	Untreated to POTW	NA	Yes
580G-02	Wire	CS	1971	5	2000	2000	Untreated to POTW	NA	Yes
580G-04	Wire	CS	1971	2	5000	5000	Untreated to POTW	NA	Yes
580G-10	Wire	CS	1971	1	8000	8000	Untreated to POTW	NA	Yes
580G-11	Wire	CS	1971	2	4000	4000	Untreated to POTW	NA	Yes
636-01	Tube	SS	NA	NA	NA	NA	CNT 3, 0.5; NW	1974	Yes
636-02	Tube	CS	1943	NA	NA	NA	CNT 3, 0.5; NW	1974	Yes
636-03	Tube	SS	NA	NA	NA	NA	CNT 3, 0.5; NW	1974	Yes
684Y	Sheet, Plate Pipe, Rod, Misc.	**	**	**	**	**	CNT 3, 17; NL; FLP; CL; F(UNK) (UNK)P; E; Rinse only	1977	No
728	Pipe	CS	1952	75	2	2	CNT 3, 3; SSP; SL(UNK); CT; RET 100; Rinses only; Cleaner hauled	1971	No
776C	Pipe, Tube	SS	1957	**	**	**	CNT 3, 40; NA; NW; FS; Rinses only; Cleaner hauled	1957	Yes
776D	Pipe, Tube	CS	1948	**	**	**	CNT 3, 40; NA; NW; Rinses only; Cleaner hauled	1973	Yes

TABLE III-1
SUMMARY TABLES
ALKALINE CLEANING - BATCH TYPE MILLS
PAGE 3

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
776G	Wire	SS	1950	NA	NA	NA	CNT 3, <1; FDS(UNK); FLP; NC	1976	No
796A	**	**	**	**	**	**	**	**	**
856N	Pipe	CS	1935	3	NA	NA	Rinses & cleaner are hauled	NA	No
856Q-01	Couplings	CS	1947	35	NA	NA	CNT(UNK), <1; SL(UNK); SS	1963	No
916A	Tube	CS	1931	NA	NA	NA	Rinses & cleaner are hauled	NA	No

NOTE: For a definition of the abbreviations used, refer to Table VII-1.
** : Confidential Information
[ ] : Data listed in brackets were received during a sampling visit.

(1) Sludge Disposal by vacuum tank truck
(2) Ferric chloride
(3) Ammonia
(4) Waste Pickle Liquor
(5) Cleaning tank wastes dumped; volume unknown
(6) About 1/5 a tank per week per line

TABLE III-2

SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
060D-01	Strip	SS	1967	213	4056	NA	CNT(UNK), (UNK); PSP; FLL; FLP; CL; SL(UNK); RET 100	1958	No
060D-02	Strip	SS	1966	132	6545	109	No Treatment	NA	No
068-02	Chain Link Fence	CS	1934	104	693	693	Untreated to POTW	NA	Yes
112A-01	Strip	CS	1936	NA	NA	NA	CNT(UNK), 1.8 to 5.3; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T	1971	No
112A-02	Strip	CS	1937	NA	NA	NA	CNT(UNK), 1.8 to 5.3; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T	1971	No
112A-03	Strip	CS	1937	NA	NA	NA	CNT(UNK), 1.8 to 5.3; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T	1971	No
112A-04	Strip	CS	1937	NA	NA	NA	CNT(UNK), 1.8 to 5.3; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T	1971	No
112A-05	Strip	CS	1956	NA	NA	NA	CNT(UNK), 0.6 to 1.8; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T; FS	1971	No
112A-06	Strip	CS	1957	NA	NA	NA	CNT(UNK), 0.6 to 1.8; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T; FS	1971	No
112A-07	Strip	CS	1957	NA	NA	NA	CNT(UNK), 0.6 to 1.8; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T; FS	1971	No
112A-08	Strip	CS	1962	1152	508	508	CNT(UNK), 0.7 to 2.0; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T; FS	1971	No
112A-09	Strip	CS	1963	1032	421	421	CNT(UNK), 0.5 to 1.5; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T; FS	1971	No
112A-10	Strip	CS	1966	960	906	906	CNT(UNK), 1.0 to 3.0; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T; FS	1971	No
112A-11	Strip	CS	1955	492	12	12	CNT(UNK), 0.007 to 0.02; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T; FS	1971	No
112A-12	Strip	CS	1956	441	13	13	CNT(UNK), 0.007 to 0.02; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T	1971	No
112A-13	Strip	CS	1970	864	221	221	CNT(UNK), 0.2 to 0.7; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T; OT; FS	1971	No
112A-14	Strip	CS	1957	369	15	15	CNT(UNK), 0.007 to 0.02; SS, SCR; NL; AE; FLA; FLP; SL(UNK); CY; T	1971	No
112A-15	Strip	CS	1958	480	12	12	CNT(UNK), 0.007 to 0.02; SS; SCR; NL; AE; FLA; FLP; SL(UNK); CY; T	1971	No
112D-01	Sheet, Black Plate	CS	1965	1614	NA	NA	CNT 3, <1; SS; CL; FLP, NW; NL; CR; SL(UNK); FS; VF; RTP-50	1964	No
112D-02	Tin & Chrome Plate	CS	1966	1156	NA	NA	CNT 3, <1; SS; CL; FLP; NW; NL; FS; VF; RTP-90	1964	No

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
PAGE 2

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
1121-01	Fasteners	CS	1927	29	NA	NA	CNT 3, 10; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
1121-10	Fasteners	CS	1955	10	NA	NA	CNT 3, <1; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
1121-11	Fasteners	CS	1952	10	NA	NA	CNT 3, <1; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
1121-12	Fasteners	CS	1958	18	NA	NA	CNT 3, <1; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
1121-13	Fasteners	CS	1971	10	NA	NA	CNT 3, <1; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
1121-14	Fasteners	CS	1971	0	NA	NA	CNT 3, <1; NW; NL; SL(UNK); SS; AE; T; FDS(UNK); E	Pre 1950	No
176-01	Strip	NA	1962	31	[615]	[615]	CNT 3, 1; FLP; NC; NW; NA; CL; T; CY	1963	No
176-02	Strip	NA	1963	10	710	710	CNT 3, 0.5; FLP; NC; NW; NA; CL; T; CY	1963	No
176-03	Strip	NA	1963	4	1108	1108	CNT 3, 0.3; FLP; NC; NW; NA; CL; T; CY	1963	No
176-04	Strip	NA	1964	12	828	828	CNT 3, 0.7; FLP; NC; NW; NA; CL; T; CY	1963	No
176-05	Strip	NA	1966	5	558	558	CNT 3, 0.2; FLP; NC; NW; NA; CL; T; CY	1963	No
176-06	Strip	NA	1968	11	1763	1763	CNT 3, 1.3; FLP; NC; NW; NA; CL; T; CY	1963	No
176-07	Strip	NA	1976	NA	NA	NA	CNT 3, 0.5; FLP; NC; NW; NA; CL; T; CY	1963	No
2560-01	Strip	**	1965	68	59	59	No treatment	NA	No
2560-02	Strip	**	1966	21	372	372	CNT(UNK), 1; NL; FLP; CL; VF	1978	No
432A-01	Sheet	CS	1960	777	NA	NA	CNT(UNK), (UNK); F; E; SS; NL; NC; FLP; CL; T; VF	1970	No
432A-02	Sheet	CS	1940	645	NA	NA	CNT(UNK), (UNK); F; E; SS; NL; NC; FLP; CL; T; VF	1970	No
432A-03	Sheet	CS	1951	768	NA	NA	CNT(UNK), (UNK); F; E; SS; NL; NC; FLP; CL; T; VF	1970	No
432K	Coil	SS	1962	95	[254]	[254]	CNT 3, 0.3; NL; SL(UNK)	NA	No
448A-01	Sheet	CS	1970	987	NA	NA	CNT(UNK), (UNK); CL; FS	1969	Yes
448A-02	Sheet	CS	1959	650	NA	NA	CNT(UNK), (UNK); CL	1969	Yes
448A-03	Sheet	CS	1954	928	NA	NA	CNT(UNK), (UNK); CL	1969	Yes
528	Sheet	SS	1961	93	387	387 - 4000	CNT 3, (UNK); NA; SS; FS; then to POTW	NA	Yes
580-01	Wire	CS	1960	1	4000	4000	Rinse Untreated to POTW; Cleaner, N(UNK); SL(UNK)	NA	Yes

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
PAGE 3

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
580-02	Wire	CS	1965	2	1875	1875	Rinse Untreated to POTW; Cleaner, H(UNK); SL(UNK)	NA	Yes
580-03	Wire	SS	1965	5	1333	1333	Rinse Untreated to POTW; Cleaner, H(UNK); SL(UNK)	NA	Yes
580-04	Wire	CS	NA	3	1500	1500	Rinse Untreated to POTW; Cleaner, H(UNK); SL(UNK)	NA	Yes
580-05	Wire	CS	1965	15	300	300	Rinse Untreated to POTW; Cleaner, H(UNK); SL(UNK)	NA	Yes
580-06	Wire	CS	1965	30	150	150	Rinse Untreated to POTW; Cleaner, H(UNK); SL(UNK)	NA	Yes
580-07	Wire	CS	1965	5	1333	1333	Rinse Untreated to POTW; Cleaner, H(UNK); SL(UNK)	NA	Yes
580A-01	Wire Cloth	CS	1962	2	21588	16849	CNT 3, 18; F(UNK)(UNK), P; NL; NW	1967	No
580A-02	Wire Cloth	CS	1962	2	23833	3426	CNT 3, 5; F(UNK)(UNK), P; NL; NW; RET, 70	1967	No
580B-01	Wire	CS	1965	15	300	300	H(UNK); Contractor Removal	NA	Yes
580B-02	Wire	CS	1965	30	150	150	H(UNK); Contractor Removal	NA	Yes
580D-01	Wire	CS	1965	15	300	300	CNT 3, 3; FLP; NW; CL; SL(UNK)	1965	No
580D-02	Wire	CS	1965	30	150	150	CNT 3, 5.2; FLP; NW; CL; SL(UNK)	1965	No
580E	Wire	CS	1950	30	150	150	CNT 3, 20; NW	1970	Yes
580G-03	Wire	CS	1971	2	3750	3750	Untreated to POTW	NA	Yes
580G-05	Wire	CS	1971	2	3750	3750	Untreated to POTW	NA	Yes
580G-06	Wire	CS	1960	2	6000	6000	Untreated to POTW	NA	Yes
580G-07	Wire	CS	1960	2	6000	6000	Untreated to POTW	NA	Yes
580G-08	Wire	CS	1960	2	6000	6000	Untreated to POTW	NA	Yes
580G-09	Wire	CS	1960	2	6000	6000	Untreated to POTW	NA	Yes
584E	Sheet	CS	1965	1005	488	NA	CNT 3, (UNK); DW; IX; BO(UNK); CR; EB; F(UNK) (UNK), P; CO; FLL; FLP; GF; NL; NW; CL; SL(UNK); SS	1960	No
584F-01	Sheet	CS	1948	714	NA	NA	CNT (UNK), <1; SL(UNK); SS	1970	No
584F-02	Strip	CS	1957	621	2	2	CNT (UNK), <1; SL(UNK); SS	1970	No
584F-03	Strip	CS	1958	237	6	6	CNT (UNK), <1; SL(UNK); SS	1970	No
584F-04	Strip	CS	1966	561	3	3	CNT (UNK), <1; SL(UNK); SS	1970	No
584F-05	Sheet	CS	1940	1077	NA	NA	No Treatment	NA	NA
584F-06	Sheet	CS	1950	1077	NA	NA	No Treatment	NA	NA
584F-07	Sheet	CS	1960	477	503	503	No Treatment	NA	NA
684*-01	Sheet	*	**	**	**	**	No Treatment	NA	No
684*-02	Fabricated and Formed Steel Items	*	**	**	**	**	No Treatment	NA	No

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
PAGE 4

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
(+)684C	Sheet	CS	1964	1011$^{(2)}$	NA	NA	CNT 3, 23; NW	1937	No
(+)684X-01	Sheet	*	**	**	**	**	No Treatment	NA	No
(+)684X-02	Sheet	*	**	**	**	**	No Treatment	NA	No
(+)684X-03	Sheet	*	**	**	**	**	No Treatment	NA	No
684Z-01	Sheet	*	**	**	**	**	Untreated to POTW	NA	Yes
684Z-02	Tube	*	**	**	**	**	Untreated to POTW	NA	Yes
760	Coil	CS	1920	65	88	88	Untreated to POTW	NA	Yes
856D-01	Sheet	CS	1938	786	NA	NA	CNT (UNK), 3; FLP; OS; SS; FLO(6)	1960	No
856D-02	Sheet	CS	1941	1245	NA	NA	CNT (UNK), 4; FLP; OS; SS; FLO(6)	1960	No
856D-03	Sheet	CS	1962	870	NA	NA	CNT (UNK), 8; FLP; OS; SS; FLO(6); FS	1960	No
(+)856E-01	Strip	SS	1969	282	894	894	No Treatment	NA	No
(+)856E-02	Strip	SS	1957	NA	NA	NA	No Treatment	NA	No
(+)856E-03	Strip	SS	1956	NA	NA	NA	No Treatment	NA	No
(+)856E-04	Strip	SS	1956	296	487	487	No Treatment	NA	No
856F	Sheet	CS	1952	882	204	204	CNT 2, 1; CR; NW; NL; FLL; SS; CL	1952	No
856Q-02	Couplings	CS	1960	38	NA	NA	CNT 3, <1; SL(UNK); SS; Cleaner Hauled	1963	No
860B-01	Coil	CS	1950	564	766	766	CNT 2, 2; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-02	Strip	CS	1951	681	1692	1692	CNT 2, 5.5; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-03	Strip	CS	1960	1029	1120	1120	CNT 2, 5.5; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-04	Sheet	CS	1943	357	1210	1210	CNT 2, 2; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-05	Coil	CS	1937	462	649	649	CNT 2, 1.4; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-06	Strip	CS	1957	762	567	567	CNT 2, 2; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-07	Sheet, Strip	CS	1962	963	935	935	CNT 2, 4.3; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-08	Strip	CS	1967	900	480	480	CNT 2, 2; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-09	Sheet, Strip	CS	1954	NA$^{(5)}$	NA$^{(5)}$	NA$^{(5)}$	CNT 2, 0; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
860B-10	Coil	CS	1967	1247	231	231	CNT 2, 1.4; EB; FLL; FLP; FLA; IX; NC; CL; CY; FS	1967	No
860B-11	Sheet, Strip	CS	1950	327	1835	1835	CNT 2, 2.9; EB; FLL; FLP; FLA; IX; NC; CL; CY	1967	No
864B-01	Coil	CS	1948	810	267	267	CNT (UNK), 1.1; SS; NL; FLL; FLP; CL; NA; FS; SDB	1972	No

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
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Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
864B-02	Coil	CS	1953	363	595	595	CNT (UNK), 1.1; SS; NL; FLL; FLP; CL; NA; SDB	1972	No
864B-03	Coil	CS	1958	561	385	385	CNT (UNK), 1.1; SS; NL; FLL; FLP; CL; NA; SDB	1972	No
864B-04	Coil	CS	1960	882	245	245	CNT (UNK), 1.1; SS; NL; FLL; FLP; CL; NA; FS; SDB	1972	No
864B-05	Coil	CS	1963	864	250	250	CNT (UNK), 1.1; SS; NL; FLL; FLP; CL; NA; FS; SDB	1972	No
864B-06	Coil	CS	1965	759	285	285	CNT (UNK), 1.1; SS; NL; FLL; FLP; CL; NA; SDB	1972	No
868A-01	Sheet	CS	1938	633	946	946	CNT 2, 7.4; F(UNK) (UNK) P; FLP; FLO(3); NL; CL; SL(UNK); SS	1971	No
868A-02	Sheet	CS	1938	855	701	701	CNT 2, 7.4, F(UNK) (UNK) P; FLP; NL; FLO(3); CL; SL(UNK); SS	1971	No
868A-03	Strip	CS	1944	450	96	96	CNT 2, 0.9; F(UNK) (UNK) P; FLP; NL; FLO(3); CL; SL(UNK); SS; FS	1971	No
868A-04	Strip	CS	1955	543	133	133	CNT 2, 1.5; F(UNK) (UNK) P; FLP; NL; FLO(3); CL; SL(UNK); SS; FS	1971	No
868A-05	Sheet	CS	1960	825	243	243	CNT 2, 3, 1; F(UNK) (UNK) P; FLP; NL; FLO(3); CL; SL(UNK); SS; FS	1971	No
868A-06	Strip	CS	1943	444	162	162	CNT 2, 1.5, F(UNK) (UNK) P; FLP; NL; FLO(3); CL; SL(UNK); SS; FS	1971	No
868A-07	Sheet	CS	1965	312	762	762	CNT 2, 2; NW; SL(UNK); SS	1930	No
920G-01	Sheet	CS	1959	676	776	776	CNT 3, 20; CR; NL; FLL; FLP; CL	1977	No
920G-02	Sheet	CS	1937	391	538	538	CNT 3, 10; CR; NL; FLL; FLP; CL	1977	No
920G-03	Sheet	CS	1957	1058	354	354	CNT 3, 15; CR; NL; FLL; FLP; CL	1977	No
920L	Coil	CS	1961	243	509	266	CNT 2, 65; CR; NL; FLP; CL	1975	No
9200	Sheet	CS	NA	240	1	1	CNT UNK, <1; NC; NA; NW; SS	1967	No
(+)948F	Pipe	CS	1959	82	176	176	Cleaner hauled; FS No Treatment for the Rinses	NA	No

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NOTE: For a definition of the abbreviations used, in addition to those listed below, see Table VII-1.

F : Flotation
SDB: Sludge Drying Beds
** : Confidential information
[ ] : Data in brackets were received during a sampling visit.
(+): Plant/line has been shutdown.

(1) Cleaning tank waste dumped once every 8 weeks, volumn unknown
(2) Tonnage listed is 1974 production. Cleaner has not operated since 1974.
(3) Waste Pickle Liquor
(4) Gravity Oil Separation
(5) Line has been permanently shutdown
(6) Ferric Chloride

TABLE III-3

ALKALINE CLEANING
MILLS SAMPLED FOR THIS STUDY

Sampling[1] Code	Plant[2] Code	Type of Steel	Type of Operation	Principle Product Processed
I	432K	Specialty	Continuous	Strip
152	176-01	Unknown	Continuous	Strip
156	112I-04	Carbon	Batch	Plate Washers
157	432K	Specialty	Continuous	Strip

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(1) The sampling code is an alphabetic or numeric code assigned at the time of sampling.

(2) The plant code is a reference code designated for each company and plant For example, 0176-01 represents the first alkaline cleaning operation at plant 0176.

TABLE III-4

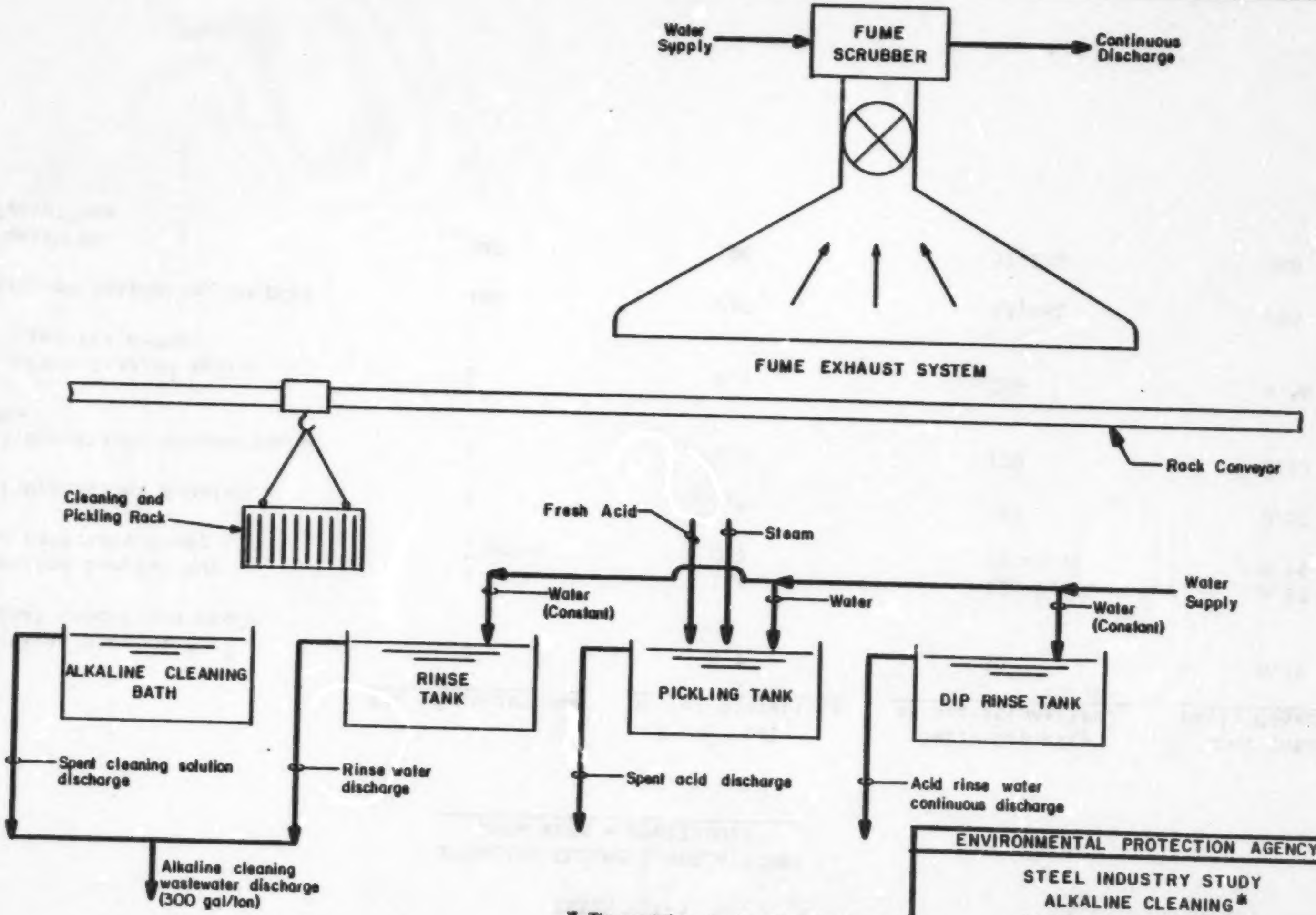
ALKALINE CLEANING SUBCATEGORY
DATA BASE - BATCH

	No. of Operations	% of Total No. of Operations	Daily Capacity of Operations (TPD)	% of Total Daily Capacity
Operations Sampled For Original Guidelines Study	0	0	0	0
Operations Sampled For Toxic Pollutant Survey	1	1.5	146	4.5
Total Operations Sampled	1	1.5	146	4.5
Total Operations Responding to D-DCPs	13	19.4	753	23.2
Operations Sampled And/Or Solicited Via D-DCPs	14	20.9	899	27.7
Operations Responding To DCPs	57	~85	2761	~85
Estimated No. Of Operations	67	100	3248	100

TABLE III-5

ALKALINE CLEANING SUBCATEGORY DATA BASE - CONTINUOUS

	No. of Operations	% of Total No. of Operations	Daily Capacity of Operations(TPD)	% of Total Daily Capacity
Operations Sampled For Original Guidelines Study	1	0.7	95	0.19
Operations Sampled For Toxic Pollutant Study	2 incl. 1 above	1.4 0.7	126 incl. 95 above	0.25 0.19
Total Operations Sampled	2	1.4	126	0.25
Total Operations Responding to D-DCPs	7	5.0	170	0.33
Operations Sampled And/Or Solicited Via D-DCPs	9	6.4	296	0.58
Operations Responding To DCPs	119	~85	43,464	~85
Estimated No. Of Operations	140	100	51,134	100


Water Supply
FUME SCRUBBER
Continuous Discharge
FUME EXHAUST SYSTEM
Rack Conveyor
Cleaning and Pickling Rack
Fresh Acid
Steam
Water (Constant)
Water
Water (Constant)
Water Supply
ALKALINE CLEANING BATH
RINSE TANK
PICKLING TANK
DIP RINSE TANK
Spent cleaning solution discharge
Rinse water discharge
Spent acid discharge
Acid rinse water continuous discharge
Alkaline cleaning wastewater discharge (300 gal/ton)

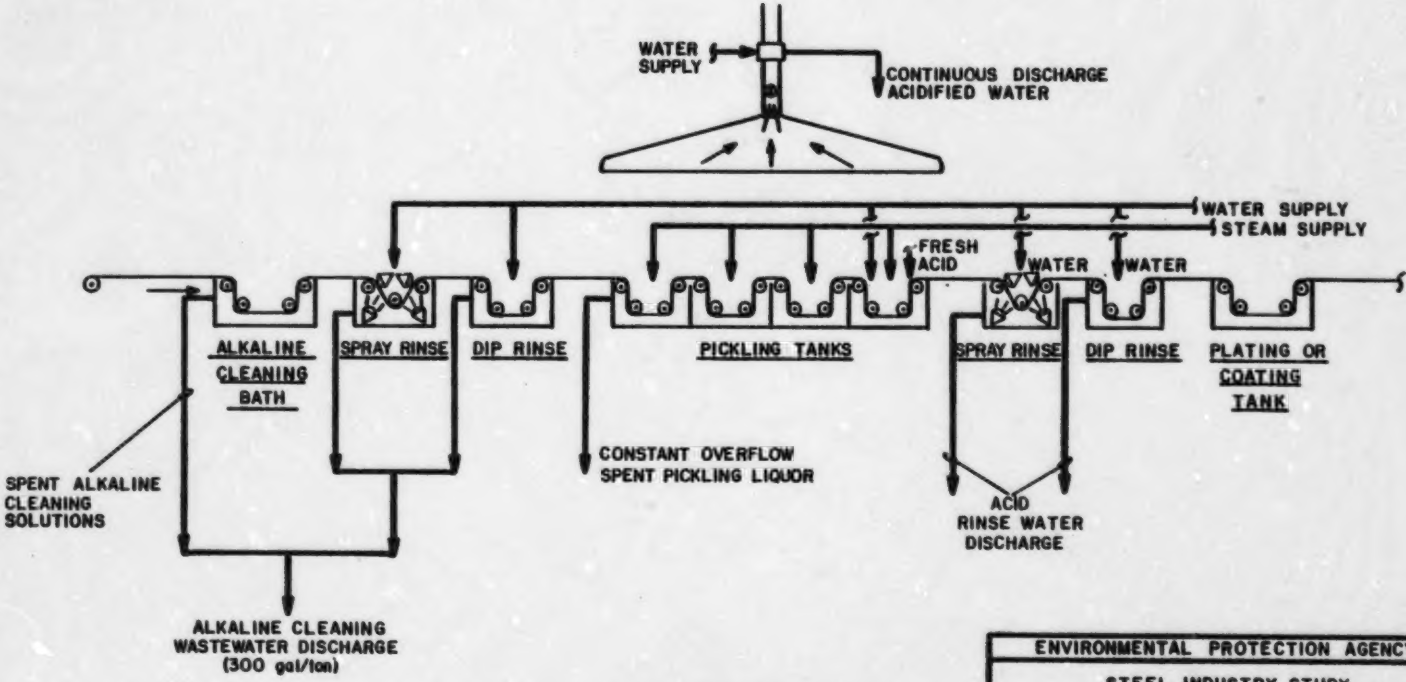
ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING*
BATCH TYPE OPERATION

Dwn. 3/19/79

FIGURE III-1

* The regulations developed in this document apply only to the alkaline cleaning bath and rinse step(s).


WATER SUPPLY
CONTINUOUS DISCHARGE ACIDIFIED WATER
WATER SUPPLY
STEAM SUPPLY
FRESH ACID
WATER
WATER
ALKALINE CLEANING BATH
SPRAY RINSE
DIP RINSE
PICKLING TANKS
SPRAY RINSE
DIP RINSE
PLATING OR COATING TANK
SPENT ALKALINE CLEANING SOLUTIONS
CONSTANT OVERFLOW SPENT PICKLING LIQUOR
ACID RINSE WATER DISCHARGE
ALKALINE CLEANING WASTEWATER DISCHARGE (300 gal/ton)

* The regulations developed in this document apply only to the alkaline cleaning bath and rinse step(s).

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING *
CONTINUOUS TYPE OPERATION

Dwn. 3/20/79

FIGURE III-2

ALKALINE CLEANING SUBCATEGORY

SECTION IV

SUBCATEGORIZATION

The Agency examined the factors that might affect the subdivision of the alkaline cleaning subcategory and found that only the mode of operation (batch and continuous) has an impact on existing sources. Both modes of operation were found to produce the same pollutants at similar levels. However, the waste volumes for continuous operations were found to be greater. The Agency has determined that the same effluent flow rates and effluent quality can be achieved for new source batch and continuous operations. Therefore, the NSPS is the same for both continuous and batch operations.

The Agency also analyzed other factors to determine if further subdivision was appropriate, but none were found to have a significant effect. The Agency analyzed the impact of line age, type of product, raw materials, wastewater characteristics, treatability of wastewater pollutants and the geographic location of the plants. However, none of these factors were found to warrant further subdivision of the alkaline cleaning subcategory. Each of these factors is reviewed below.

Manufacturing Process and Equipment

The Agency examined differences in the alkaline cleaning operations which might affect subdivision. For example, there are two ways in which the alkaline cleaning process is performed. The cleaning can be achieved in either batch fashion, where the product is moved manually in and out of cleaning and rinse tanks, or it can be completed in a continuous fashion on sheet, strip or wire products. Alkaline cleaning operations can also be integrated into larger production lines. Industry responses to the DCPs show that alkaline cleaning lines are used in conjunction with coating, annealing, galvanizing, plating and pickling lines. The Agency considered whether these different types of operations may affect the flow (applied or discharge) or wastewater characteristics and thus warrant further subdivision. The Agency found that these variations have a significant effect on the effluent volume but not on the pollutants contained in the process wastewaters. Batch operations have lower average flow rates (250 gal/ton) and discharge lesser amounts of pollutants than continuous operations, which have an average discharge flow of about 350 gal/ton. No significant differences were found among alkaline cleaning operations that are part of larger complexes (Table IV-1). For these reasons, the Agency concluded that further subdivision of the existing alkaline cleaning subcategory into batch and continuous subdivisions, based upon differences in wastewater flow rates, is appropriate.

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Final Products

The products processed in alkaline cleaning operations vary from sheet and strip to chain link fence. The Agency concluded that the product being cleaned does not significantly affect the quality or quantity of the wastewaters generated. Thus, further subdivision based upon this factor is not warranted.

Three lines were sampled for this study. While the Agency found that the wastewater quality varied between these lines, these variations were not significant. The concentrations of toxic pollutants remained below or near treatability levels. Hence, even if the type of pollutants present in the wastewaters from lines processing different products varied, there would be no effect on the treatment required, the treatment system selected, or the ability to achieve the same level of treatment.

The Agency also analyzed the potential for variations in wastewater flow depending on the final product being processed. The Agency originally thought that some of the processed product shapes (such as sheet and strip) might be easier to rinse than other products (such as tubes and wire). However, when the discharge flow data were analyzed no significant flow variations related to product type were found. Many mills producing different products achieve the flow values upon which the limitations and standards are based. These data are summarized in Table IV-1. For continuous mills, strip, sheet, and wire are the primary products processed. Low discharge flow rates are demonstrated for each. The Agency found that the model BPT flow of 250 gal/ton for batch mills is demonstrated for all product types that are batch cleaned.

The applied and discharge flow rates for wire products appear to be significantly higher than for any other product type, often in the range of thousands of gallons per ton. The Agency found similar applied flow rates, on a gallon per minute basis, for these lines as found at other lines. Due to the low tonnage processed (less than 1 ton/turn), the flow on a gallon per ton basis is extremely high. The cleaning process at these lines is used intermittently. As a result, pollutants from the process are generated during a small portion of the eight hour turn. Flow calculations are based upon constant production over the eight hour period. Thus, the results of the calculations are higher than actual flow rates on a gal/ton basis. The Agency could not adjust these flow values due to the unavailability of data on the length of time each alkaline cleaning operation was actually in use.

The Agency believes that changes in the operating practices at the smaller wire lines can be implemented. The cleaning baths and rinse tanks should be equipped with product activated flow or spray rinse valves, so that flows occur only when the tanks are being used. These changes would enable these lines to achieve flow rates comparable with those from other lines. These practices should not cause problems to the alkaline cleaning process and, if implemented properly, should not cause disruptions in other parts of the finishing line.

Raw Materials

Carbon, stainless, and other types of steel are processed in alkaline cleaning operations. For purposes of this discussion, any line processing more than 50% carbon steel is considered to be a "carbon" steel line. The Agency found that the type of steel being processed does not significantly affect the quality or quantity of wastewater generated. For this reason, the Agency concluded that further subdivision based upon the type of raw material used (i.e., the type of steel processed) is not appropriate.

During its study, the Agency sampled one specialty line, one carbon steel line and one operation which was not clearly designated. No significant differences were noted in the wastewater characteristics of these lines. All types of lines use similar cleaning solutions and operating practices and achieve similar flow rates regardless of the type of steel used. Based upon the available data, the Agency does not believe that there are significant variations in wastewater quality between carbon and specialty lines.

The Agency also analyzed wastewater flow variations which result from processing carbon and specialty steels. The Agency found that there are no significant differences between flow rates for carbon and specialty lines. There is a difference between carbon and specialty average flow rates for batch operations. However, this difference is attributable to the extremely small data base for the specialty lines (3 lines) and not to any particular variation in the operation of the lines.

Carbon and specialty steel alkaline cleaning lines do vary in size. The Agency found that continuous operations were, on the average, ten times larger than batch operations. This difference does not affect further subdivision beyond the flow differences related to the mode of operation. Separate cost estimates were made for batch and continuous operations to develop more representative required investment costs.

Wastewater Characteristics

Wastewaters from alkaline cleaning operations originate from two sources: the cleaning solutions and the rinse step or steps that follow the cleaning operation. The characteristics of the wastewaters leaving the process depend primarily upon three elements; (1) the solutions used in the cleaning baths; (2) the degree of carry-over of the pollutants from the cleaning tanks to the rinse step; and, (3) the frequency of dumping the cleaning solution tanks.

Based upon the analysis of data for this subcategory, the Agency believes that there are no significant variations in the wastewater characteristics from various alkaline cleaning operations. Although the types of toxic pollutants present in the wastewaters may vary between lines, the concentration of these pollutants remain below or near treatability levels.

Wastewater Treatability

The Agency analyzed the treatability of wastewaters from the different types of alkaline cleaning operations. Based upon the data developed during the plant visits and the data supplied in the DCPs, the Agency found that there are no significant differences in wastewater treatability among the different types of cleaning operations. As noted above, pollutants found in various alkaline cleaning wastewaters are present at levels below or near treatability levels. If treated separately, wastewaters from most alkaline cleaning lines would only require pH control. For these reasons, the Agency has concluded that further subdivision of this subcategory based upon wastewater treatability is not appropriate.

Size and Age

Consideration was also given to the impact of size and age on the subdivision of the alkaline cleaning subcategory. The result of this analysis did not indicate that subdivision on those bases were appropriate.

While alkaline cleaning operations vary in physical size, layout, and product size, the Agency found that these factors do not significantly affect process water usage, discharge flow rates, or effluent quality. Figure IV-1 shows a plot which analyzes the relationship between discharge flow and production capacity for batch operations. A similar plot for continuous operations is illustrated in Figure IV-2. Cleaning lines over a wide size range have achieved the model flow rates of 250 gal/ton for batch operations and 350 gal/ton for continuous operations. Additionally, the Agency found that the size of the operation does not affect wastewater characteristics, as all lines are operated in similar manners, and the wastewater characteristics remain relatively constant regardless of size.

The relationship between flow and age was analyzed in a similar fashion. Also illustrated in Figure IV-1 and Figure IV-2 are plots of flow vs. age for batch and continuous operations, respectively. These plots demonstrate that the model plant flows are achieved at lines over a broad range of ages. Therefore, the Agency concluded that age has no significant impact on discharge flow.

The Agency investigated the effect of age on the feasibility and cost of retrofitting pollution control equipment at alkaline cleaning lines. Comparison of the age of a cleaning line with the year in which pollution control facilities were installed demonstrates that pollution control equipment can be retrofitted, see Table IV-2. The discussion above indicates that similar levels of pollutant discharge are achievable at alkaline cleaning lines of all ages. As a result, the Agency has concluded that retrofitting pollution control to older alkaline cleaning lines is feasible.

Most alkaline cleaning wastewaters are treated in central treatment facilities. As a result, the industry was either unable to provide retrofit costs or reported that costs were not significant. In addition, as discussed in Section VIII, a comparison of actual costs incurred by the industry with the Agency's estimated costs demonstrates that the Agency's estimates sufficiently account for retrofit and other site-specific costs. The Agency thus concludes that the cost of retrofitting pollution control equipment at alkaline cleaning lines has been accounted for.

From the analyses conducted above, the Agency concludes that age and size do not affect the ability of alkaline cleaning lines to achieve the flow rates and effluent levels which form the basis of the limitations and standards. Additionally, age and size do not affect the ability to install the appropriate pollution control technology for alkaline cleaning operations. Accordingly, the Agency concluded that further subdivision based upon size or age is not appropriate.

Geographic Location

An examination of the raw waste characteristics, process water application rates, discharge rates, effluent quality and other pertinent factors relative to plant location revealed no general relationship or pattern. Alkaline cleaning lines are located in sixteen states. Most of these lines are located in the major steel producing areas of Illinois, Indiana, Pennsylvania, and Ohio. Table IV-3 summarizes the location of alkaline cleaning operations responding to the DCPs.

A small number of lines are located in what could be considered "arid" or "semi-arid" regions. For this reason, the Agency gave special attention to the consumptive use of water in these regions. However, because no cooling systems are required to achieve the limitations and standards, additional water consumption is not expected to result from compliance with the limitations or standards.

Process Water Usage

The Agency found that water use varies in this subcategory only in relation to the mode of operation, i.e., batch or continuous. The Agency also found that water conservation practices are available to achieve a fairly uniform discharge flow rate for new source lines. Hence, further subdivision on the basis of water use is not warranted for existing sources.

TABLE IV-1

ALKALINE CLEANING OPERATIONS
DISCHARGE FLOW AND SUBSEQUENT FINISHING OPERATIONS

Plant Code	Discharge Flow(GPT)	Type of Finishing Operation	Product Type	Type of Operation
09200	1	w/Electroplating	Sheet	Continuous
0584F-02	2	w/Hot Coating	Strip	Continuous
0728	2	Stand Alone	Pipe	Batch
0584F-04	3	w/Hot Coating	Strip	Continuous
0584F-03	6	w/Hot Coating	Strip	Continuous
0240C	7	w/Hot Coating	Tubes	Batch
0112A-11	12	w/Cleaning Line	Strip	Continuous
0112A-15	12	w/Cold Coating	Strip	Continuous
0112A-12	13	w/Cold Coating	Strip	Continuous
0112A-14	15	w/Cold Coating	Strip	Continuous
0240B-01	24	Stand Alone	Tubes	Batch
0240B-02	28	Stand Alone	Tubes	Batch
0060N-01	42	Stand Alone	Tubes	Batch
0060N-02	42	Stand Alone	Pipe	Batch
0240B-03	53	Stand Alone	Tubes	Batch
02560-01	59	w/Bright Anneal	Strip	Continuous
0760	88	w/Copper Coating	Coil	Continuous
0868A-03	96	w/Cold Coating	Strip	Continuous
0060D-02	109	w/Annealing Line	Strip	Continuous
0868A-04	133	w/Cold Coating	Strip	Continuous
0580	150	w/Brass Plating	Wire	Continuous
0580B-02	150	w/Cold Coating	Wire	Continuous
0580D-02	150	w/Cold Coating	Wire	Continuous
0580E-06	150	w/Cold Coating	Wire	Continuous
0868A-06	162	w/Cold Coating	Strip	Continuous
0384A	168	w/Hot Coating	Strip & Sheet	Batch
0460H	170	w/Cold Coating	Wire	Batch
0948F	176	w/Cold Coating	Pipe & Tube	Continuous
0856F	204	Stand Alone	Sheet	Continuous
0548B-01	216	w/Acid Pickling	Tubes	Batch
0112A-13	221	w/Cold Coating	Strip	Continuous
0860B-10	231	Stand Alone	Sheet	Continuous
0068-03	236	w/Acid Pickling	Rod	Batch
0868A-05	243	w/Galv. Line	Sheet	Continuous
0864B-04	245	w/Annealing Line	Sheet	Continuous
0864B-05	250	w/Degreasing Line	Strip	Continuous
0864B-06	285	w/Hot Coating	Coil	Continuous
0580-05	300	w/Cold Coating	Wire	Continuous
0580B-01	300	w/Cold Coating	Wire	Continuous
0580D-01	300	w/Cold Coating	Wire	Continuous
0432K	305	w/Degreasing Line	Coil	Continuous

TABLE IV-2

ALKALINE CLEANING SUBCATEGORY
PLANTS WITH RETROFITTED POLLUTION CONTROL SYSTEMS

Batch

Plant Code	Plant Age (Year)	Treatment Plant Age (Year)
112C	1914	1977
112I	1922	1950
240B	1938	1968
248C	1973	1975
256N	1965	1973
384A	1968	1970
460D	1959	1970
476A	1960	1977
548	1927	1969
548A	1957	1967
580A	1962	1967
636	1943	1974
728	1952	1971
776D	1948	1973
776G	1950	1976
856Q	1947	1963

Continuous

Plant Code	Plant Age (Year)	Treatment Plant Age (Year)
112A	1936	1971
112I	1927	1950
256O	1966	1978
432A	1951	1970
448A	1954	1969
580A	1962	1967
580E	1950	1970
584F	1948	1970
856D	1938	1960
856Q	1960	1963
860B	1937	1967
864B	1948	1972
868A	1938	1971
920G	1937	1977
920L	1961	1975

TABLE IV-3

LOCATION OF ALKALINE CLEANING OPERATIONS

Location	Total Number	% of Total
Pennsylvania	55	31.3
Ohio	23	13.1
Indiana	18	10.2
Maryland	15	8.5
Massachusetts	11	6.3
Michigan	10	5.7
West Virginia	8	4.5
Alabama	8	4.5
California	7	4.0
Texas	5	2.8
Wisconsin	5	2.8
Georgia	3	1.7
Illinois	3	1.7
Kentucky	3	1.7
Connecticut	1	0.6
Mississippi	1	0.6
# of States = 16	176	100%

FIGURE IV-1
ALKALINE CLEANING SUBCATEGORY
BATCH

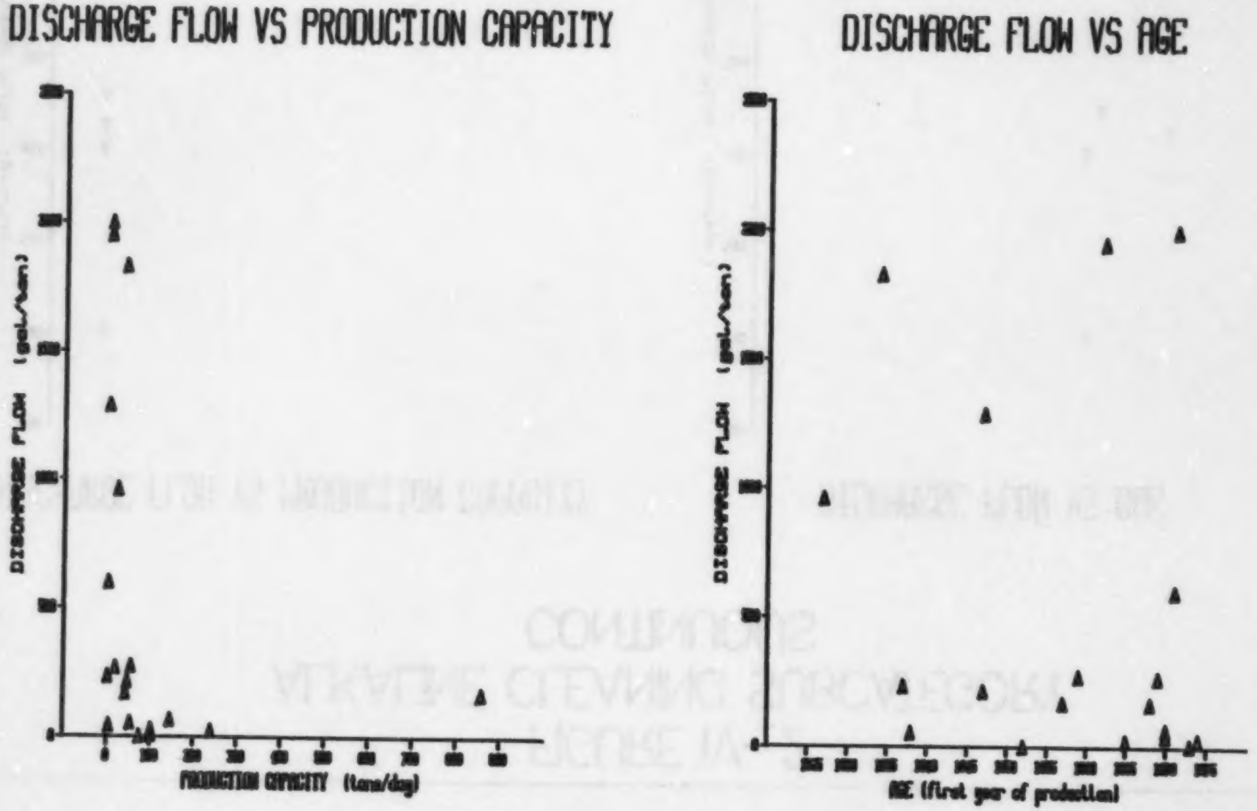
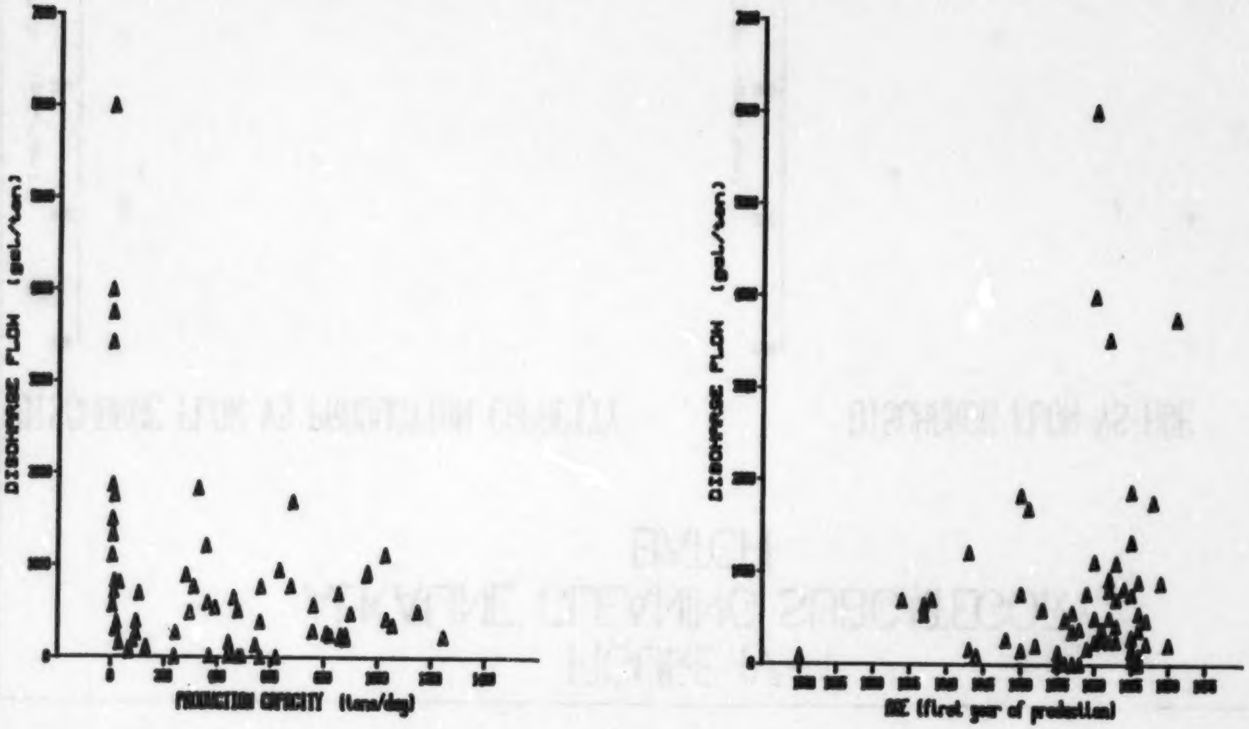


FIGURE IV-2
ALKALINE CLEANING SUBCATEGORY
CONTINUOUS


DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

ALKALINE CLEANING SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERIZATION

Introduction

Process water use within the alkaline cleaning subcategory is a major factor in determining pollutant loads and estimating the cost for removal of pollutants. The Agency analyzed the data from the sampling surveys and the DCP responses to evaluate process water use within this subcategory and to obtain the total subcategory wastewater volume.

Alkaline Cleaning Operations

As noted earlier, alkaline cleaning is accomplished in batch and continuous operations. In both operations, the product is cleaned in alkaline solutions prior to entering other finishing operations. As explained in the preceding sections, wastewater characteristics do not vary significantly from operation to operation. However, flow rates do vary between the batch and continuous modes of operation. In the proposed regulation, a model flow of 50 gal/ton was used to derive limitations and standards for all types of operations. Comments were received which stated that such a tight flow restriction could cause product quality problems. The Agency believes that given the nature of the process, these concerns are valid and to alleviate any such problems, the Agency has revised the model flow rates at BPT and BCT upon "average of the best" considerations (see Section IX discussion). Model flow rates of 250 gal/ton and 350 gal/ton are used to derive the BPT and BCT limitations for batch and continuous operations, respectively. At NSPS, a lower flow is used to derive the promulgated standards. A model flow of 50 gal/ton has been selected based upon the best demonstrated flow rates at several batch and continuous operations. The Agency believes that new alkaline cleaning operations will be able to design operations and conserve sufficient water to achieve NSPS, which are based upon the tighter model discharge flow rate.

Wastewaters are discharged from two sources in alkaline cleaning lines: the cleaning solution tank and the subsequent rinsing steps. The cleaning solution tank contains a caustic solution which generally has high levels of sodium compounds and other constituents depending on the type of solution used. At some lines, the cleaning solution is reused continuously. Fresh solution is added to make up for dragout and evaporative losses. The baths are discharged periodically to limit the buildup of contaminants (dissolved solids and oils), or as soon as the cleaning ability of the solution is impaired. A process being developed includes an ultrafiltration system that continuously treats the alkaline cleaning solutions and permits higher reuse rates.

Because most alkaline cleaning baths are used to process high tonnages, pollutants can build up in these baths to high levels. Typical levels of pollutants found in alkaline cleaning baths are shown below:

Pollutant or Wastewater Characteristic	Typical Values (mg/l)
Alkalinity	1,000
Iron, total	100
Oil & Grease	1,500
pH (units)	12-13
Total Dissolved Solids	25,000
Total Suspended Solids	1,000
Temperature	70°-200°F

The other source of wastewaters from the alkaline cleaning process is the rinse step(s) following the cleaning operation. After immersion of the product into the cleaning bath, rinsing is required to remove residual cleaning solution from the product. The rinsing is usually done in dip tanks or spray chambers, and there can be either one or several tanks depending upon the degree of rinsing required. Although some lines have standing rinse tanks (no continuous flow through the tanks), many lines have rinse tanks with continuous water feed and overflow. This is done to keep the rinsewater relatively free of contaminants and to cool the product, if necessary.

During the course of this study, the Agency obtained sampling data for three different lines. The rinsewater was sampled at each line. Because the discharges from batch and continuous operations are similar, the data for these operations have been combined. It should be noted that Plant 0432K was visited twice, but only the data gathered during the most recent visit are included. During the original survey at Plant 0432K, the spent alkaline solution was being discharged, and thus the sample analysis showed extremely high levels of total suspended solids (about 500 mg/l). The level that was detected at that time exceeds the average concentration of suspended solids found in alkaline cleaning wastewaters by a factor of 50. The data gather at the three sampled lines are presented in Table V-1. Net concentrations are listed in this table to better demonstrate the additions of pollutants contributed by alkaline cleaning operations. Averages are also listed, where appropriate, to show a typical level of pollutants that can be expected in rinsewaters from the alkaline cleaning process. As shown, alkaline cleaning operations do not normally add significant levels of pollutants to the rinse waters.

TABLE V-1

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
ALKALINE CLEANING SUBCATEGORY
NET CONCENTRATIONS OF POLLUTANTS IN RAW WASTEWATERS(1)

Reference No.	0176-01	0112I-04	0432K	
Plant Code	152	156	157	Average
Sample Points	(V-W)	(C-A)	(C-A)	
Flow (gal/ton)	815	67	254	379
Type of Mill	Continuous	Batch	Continuous	-
Dissolved Iron	0.10	0.30	0.03	0.14
Oil & Grease	4.0	5.5	18.3	9.3
Suspended Solids	-	11.0	16.7	9.2
pH, units	8.9-9.1	7.2-8.1	10.3-11.7	7.2-11.7
23 Chloroform	0.020	0.0	0.003	0.008
36 2,6-Dinitrotoluene	ND	ND	0.047	0.016
39 Fluoranthene	0.0	0.0	0.051	0.017
64 Pentachlorophenol	ND	0.029	ND	<0.010
65 Phenol	ND	ND	0.021	0.007
66 Bis(2-ethylhexyl)phthalate	-	0.020	0.49	0.17
68 Di-n-butyl phthalate	0.0	0.0	0.086	0.029
69 Di-n-octyl phthalate	ND	ND	0.031	0.010
71 Dimethyl phthalate	ND	ND	0.12	0.040
73 Benzo(a)pyrene	ND	ND	0.010	0.003
84 Pyrene	0.0	0.0	0.032	0.011
85 Tetrachloroethylene	0.027	0.0	-	0.009
114 Antimony	NA	NA	0.030	0.030
119 Chromium	0.0	0.055	-	0.018
121 Cyanide, Total	0.034	0.003	0.0	0.012
122 Lead	0.040	0.075	-	0.038
124 Nickel	0.025	0.015	0.0	0.013
125 Selenium	NA	NA	0.070	0.070
128 Zinc	-	0.22	-	0.073

NA: Not analyzed
NR: Not reported
ND: Not detected
- : Calculation yielded a negative value.

(1) All values are in mg/l unless otherwise noted.
(2) The concentrations listed for Plant 0796A are all gross effluent values due to the unavailability of influent data.

ALKALINE CLEANING SUBCATEGORY

SECTION VI

WASTEWATER POLLUTANTS

This section describes the wastewater pollutants characteristic of alkaline cleaning operations and the basis for the Agency's selection of those pollutants for which limitations have been promulgated. The first step in this process involved the development of a list of pollutants considered to be representative or characteristic of the alkaline cleaning process. This list is based upon data gathered during the original guidelines study and through DCP responses.

This initial list of pollutants was confirmed by data collected from field sampling visits conducted during this study. A review of the monitoring data for the wastewater samples collected during all of the field sampling programs formed the basis for the final selection of pollutants for which limitations and standards were promulgated.

Five pollutants were limited in the prior regulation: total suspended solids, dissolved iron, dissolved chromium, dissolved nickel, and pH. This regulation contains limitations for total suspended solids, oil and grease, and pH. Additional information on these changes are provided below.

The Agency deleted limitations and standards for dissolved nickel, chromium, and iron. In the prior regulation, these pollutants were limited because high levels were detected at the one line that was sampled (Plant I). However, the wastewater monitored at this line included wastewaters from pickling and alkaline cleaning operations and included dumped alkaline cleaning baths. The Agency believes that the levels of these three pollutants are most likely attributable to the pickling wastewaters or the alkaline cleaning bath and not to the alkaline cleaning rinse waters. This conclusion is based upon the additional data collected at the three plants visited for this study. Those data show that the concentrations of these three pollutants in the rinse waters from alkaline cleaning operations are low.

Wastewaters from alkaline cleaning operations are relatively clean compared to wastewaters from other steel industry operations. However, there is the potential for high concentrations of various pollutants in the discharge from the lines, particularly when the spent solutions are being discharged. Suspended solids, oil and grease, toxic metals (antimony, lead, selenium, and zinc) and high pH are found in alkaline cleaning wastewaters. These pollutants are primarily generated in the the cleaning baths.

The suspended solids and toxic metal pollutants originate when the dirt, soot and scale are removed from the steel product in the cleaning bath. Because the solution is not as aggressive as some of

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the other cleaning steps (i.e., pickling and salt bath descaling), the solutions do not contain high concentrations of most toxic metal pollutants. Suspended solids and oils and greases are the principal pollutants washed off the surface of the metal. The discharges from the cleaning lines also have a high pH. The high pH values result from the alkaline solutions used in the process; pH levels of 9-12 are common to alkaline cleaning wastewaters.

Sampling of toxic pollutants was also performed during this study. The Agency did not expect to find toxic pollutants at significant levels. A list was developed which summarizes the toxic pollutants known to be present in alkaline cleaning wastewaters (Table VI-1). This list is based upon data gathered from the sampling visits and responses by the industry.

Using the sampling data, the Agency calculated a net concentration for each pollutant found in the raw wastewaters. A net raw value was used, because this value best describes the contribution of pollutants from the alkaline cleaning process. All pollutants found in the raw wastewater, at an average net concentration of 0.010 mg/l or greater, at any of the lines sampled are listed in Table VI-1. The list of toxic pollutants, which the Agency concluded as being characteristic of the alkaline cleaning subcategory, is presented in Table VI-2. Also included in this table are the nontoxic pollutants determined to be characteristic of the process.

Five additional pollutants were detected at an average concentration greater than 0.010 mg/l but are not listed in Tables VI-1 or VI-2. The Agency believes that their presence is not attributable to alkaline cleaning operations. Methylene chloride was detected at high concentrations but was omitted, because this compound is commonly used as a cleaning agent in the laboratory and its presence is ascribed to this practice, not to the alkaline cleaning operation. Also, four phthalate compounds were detected at levels greater than 0.010 mg/l. The Agency believes their presence is probably related to plasticizers in the tubing used in collecting the samples.

Based upon the analyses conducted above and in Section V, the Agency concluded that none of the toxic pollutants are present in the rinse waters from alkaline cleaning lines at concentrations sufficient to warrant limitation at BAT. After BPT treatment, all the pollutants are present in concentrations that are below practical treatability levels. Aside from reducing the BPT/BCT effluent volume through recycle or water conservation practices, there are no economically achievable treatment technologies which the Agency is aware of to reduce the loading of those pollutants by a significant amount. Recycle is being practiced at only one plant in this subcategory. However, the alkaline cleaning wastewaters at this plant are mixed with other wastewaters, and the combined waste stream is reused at different processes. The Agency has no other information regarding the recycling of alkaline cleaning wastewaters and whether water conservation practices (such as counter-current rinsing) can be applied at these operations. As a result, the Agency has been unable to assess the feasibility of reducing discharge flow rates of existing alkaline cleaning operations using these practices. The data nevertheless demonstrate that low flow rates are achieveable. Plants are achieving flows below 50 gal/ton.

TABLE VI-1

TOXIC POLLUTANTS KNOWN TO BE PRESENT IN ALKALINE CLEANING WASTEWATERS

Toxic Pollutant	
23	Chloroform
36	2,6-Dinitrotoluene
39	Fluoranthene
64	Pentachlorophenol
65	Phenol
73	Benzo(a)pyrene
84	Pyrene
85	Tetrachloroethylene
114	Antimony
119	Chromium
121	Cyanide, Total
122	Lead
124	Nickel
125	Selenium
128	Zinc

TABLE VI-2

SELECTED POLLUTANTS
ALKALINE CLEANING SUBCATEGORY

	Dissolved Iron
	Oil & Grease
	Total Suspended Solids
	pH
36	2,6-Dinitrotoluene
39	Fluoranthene
84	Pyrene
114	Antimony
119	Chromium
121	Cyanide, Total
122	Lead
124	Nickel
125	Selenium
128	Zinc

ALKALINE CLEANING SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

Introduction

A review of the control and treatment technologies currently in use or available for use in the alkaline cleaning subcategory provided the basis for selecting the BPT, BCT, and NSPS alternative treatment systems. This review involved summarizing questionnaire and plant visit data in order to identify those treatment components and systems in use at alkaline cleaning operations. The Agency analyzed the treatment components and systems most appropriate for the various levels of treatment. This section also presents the raw wastewater and treated effluent analytical data for the plants sampled and a short description of the treatment at each of the sampled plants.

Summary of Treatment Practices Currently Employed

As explained previously, wastewater in the alkaline cleaning operations is generated in the cleaning tanks and the rinse step(s) following the cleaning operation. The wastewater and treatment techniques practiced at the operating alkaline cleaning lines vary, but most are treated in central treatment systems with similar components. The Agency used data from the DCPs and plant visits to identify the treatment methods practiced at alkaline cleaning operations. Based upon these data, the Agency developed the following summary of disposal and treatment techniques:

	Operations With Treatment or Disposal Practice	% of Total
Lines with treatment of any kind	110	64.7
Lines discharging to POTWs	46	27.0
Lines with wastes hauled	4	2.4
Lines that do not have any treatment	10	5.9
Total	170	100%

All alkaline cleaning lines that provide treatment do so in central treatment systems. These treatment systems usually receive

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wastewaters from operations that have similar or compatible wastewaters and, thus, are designed primarily to reduce the levels of suspended solids, oils and greases, and toxic metals as well as to neutralize the pH of the discharge. The types of treatment provided for the lines surveyed are outlined below.

The first treatment step that is carried out at many operations is equalization. Because of the potential for batch discharges and for wastewaters from other operations to be combined with alkaline cleaning wastewaters, equalization is often provided prior to subsequent treatment.

Because of the presence of oils and greases in the wastewaters, oil separation is usually practiced. While several methods of oil removal are used in this subcategory (e.g., API separation, trough type, belt type skimmer), surface skimming in the equalization basin is most often practiced.

After equalization and oil separation, the wastewaters are neutralized. The DCP responses indicate that this is done in two ways. If the other wastewaters entering the central treatment system are acidic, then the alkalinity of the wastewaters from the alkaline cleaning operations is neutralized to the required pH range by comingling with those other wastewaters. This practice is common at many mills, as it reduces chemical costs. If acidic wastewaters are not present in the central treatment systems, then acid must be added to neutralize the alkaline cleaning wastewaters. The operating costs of this system are higher than other types of neutralization systems because of the amount of acid required to neutralize the alkaline cleaning wastewaters. Only 11% of the alkaline cleaning lines have auxiliary acid addition systems installed in the the event that the acidity of the other wastewaters entering the central treatment system is not sufficient to completely neutralize the alkaline cleaning wastewaters.

After neutralization and oil skimming, polymers are usually added in a mixing tank to promote flocculation and sedimentation in clarification systems. Various chemical agents are used to achieve optimum settling, depending on the exact nature of the wastewaters. One operation reported the use of anionic polymers to promote solids flocculation and sedimentation. This alkaline cleaning operation discharges to a central treatment facility, where the anionic polymers are mixed with the combined wastewaters.

After equalization, oil skimming and chemical addition, removal of the suspended solids and metals is commonly practiced in central treatment systems that include alkaline cleaning wastewaters. Eighteen alkaline cleaning operations have settling lagoons as a sedimentation device; nineteen have flocculation-clarifiers alone, or in conjunction with settling lagoons; and eight have thickeners to achieve suspended solids and metals removal. Also, filters are installed at eight operations. The choice of clarification or filtration depends upon the amount of land available for installation of the treatment system and the other types of wastewaters that are treated in the central treatment systems.

In the clarification or filtration step, sludges generated as solids, oils, and precipitated metals are removed from the wastewaters. Large volumes of sludge can be generated depending upon the wastewaters being treated and the type of neutralization carried out. Both centrifuges and vacuum filters are used for sludge dewatering.

Advanced Treatment Systems Considered for the Alkaline Cleaning Subcategory

As shown in Section V, the Agency detected toxic organic and toxic metal pollutants below or near treatability levels in untreated alkaline cleaning wastewaters. For this reason, the Agency did not consider additional wastewater treatment, beyond BPT, that would achieve further concentration reductions of the toxic pollutants. Instead, the Agency considered advanced treatment systems which would reduce or eliminate the wastewater flow from the alkaline cleaning operation and thus reduce the pollutant load being discharged.

A description of the advanced treatment alternatives considered by the Agency for alkaline cleaning operations is presented below. These systems have been demonstrated, to varying degrees, in the alkaline cleaning subcategory or in other industrial applications on wastewaters with characteristics similar to alkaline cleaning wastewaters.

1. Ultrafiltration

Ultrafiltration (UF) is a pressure driven process for separating high molecular weight solutes or colloids from water solutions by means of a permeable membrane. The wastewater is filtered by passing it through the membrane under low pressure.

This process is now being used on alkaline cleaning baths in other industries. These baths are quite amenable to ultrafiltration, resulting in the concentration of the dilute oily waste and the recycle of the alkaline cleaning chemicals. Since UF membranes allow only the low molecular weight solutes and water to pass through, the emulsified oil and particulates are held back and concentrated. The concentrate is not returned to the cleaning bath. The main components of the cleaning solutions, the alkali and builders, are generally low molecular weight solutes. These materials pass through the membrane freely and are returned to the cleaning bath. By using this system, the amount of pollutants discharged from the cleaning bath is reduced significantly. This technology reduces the chemical costs needed to make up the solutions, improves the cleaning characteristics of the bath and reduces the pollutant load generated by the alkaline cleaning process.

While no data are presently available regarding the application of this technology to alkaline cleaning solutions, it is expected that this system will work quite effectively. Although this technology is capital intensive, a payback period of less than 3 years is predicted because of the savings achieved due to the reuse of the cleaning solutions. While the installation of this treatment system would reduce the volume of spent cleaning solutions requiring treatment, it does not address rinsewaters.

2. Vapor Compression Distillation (Evaporation)

Vapor compression distillation is typically used to concentrate a high dissolved solids wastestream (3,000-10,000 mg/l) to a slurry consistency (approximately 100,000 mg/l). The slurry discharge can be dried in a mechanical drier or allowed to crystallize in a small solar or steam-heated pond prior to final disposal. The distillate quality water generated by this system can be recycled to the alkaline cleaning operation thereby eliminating all discharges to navigable waters. One desirable feature of this unit is its relative freedom from scaling. Because of the unique design of the system, calcium sulfate and silicate crystals grow in solution as opposed to depositing on heat transfer surfaces. Economic operation of this system requires a high calcium to sodium ratio (hard water).

Due to economic considerations, only limited application is made of vapor compression distillation in processing wastewater. Vapor compression distillation may be the only possible means to achieve zero discharge of process water for alkaline cleaning operations.

3. Counter-Current Rinse System

The installation of counter-current (cascade) rinse systems can substantially reduce the rinsewater flows discharged from the alkaline cleaning process. This system would replace or modify the existing rinsing system to achieve a multiple tank arrangement in series. The water flow to the tanks is reduced and cascades from one tank to the next. The product being cleaned travels in the opposite direction to the water flow and thus encounters progressively cleaner water. This type of arrangement reduces the wastewater flow (i.e., the waste volume), concentrates the pollutants in the first rinsing chamber and achieves a more thorough rinsing because of the multiple rinsing achieved in the series of tanks. Although this type of rinsing is ideally suited for continuous operations it can also be implemented at batch type operations. The rinsing operation carried out in the alkaline cleaning process is similar to the rinsing operations in pickling and hot coating which include cascade rinse systems. There is a great potential for the use of this system. However, the Agency does not have information on the use of cascade rinsing in this subcategory.

4. **Reuse Systems**

As the wastewaters from alkaline cleaning operations are relatively clean after treatment, there is a great potential for reuse. While reuse rates up to 100% were demonstrated, these high rates where achieved mainly because the alkaline cleaning wastewaters were diluted with other wastes in large central treatment systems. A reuse rate of 50% to other processes has been demonstrated at numerous lines.

5. **Recycle Systems**

The low pollutant concentrations associated with alkaline cleaning wastewaters provide a great potential for the recycle of the treated effluent. A recycle system could significantly decrease the discharge from alkaline cleaning operations. With a recycle rate of 90%, the model BPT/BCT effluent flows of 250 and 350 gal/ton could be reduced to 25 and 35 gal/ton, respectively. Only limited use has been made of this technology in the alkaline cleaning subcategory. The one plant using recycle (0112D) has two lines in operation. Fifty and ninety percent of the process water required by these two lines is central treatment effluent supplied using recycle systems. In addition to flow reduction, recycle systems also decrease the pollutant load being discharged.

Summary of Sampling Visit Data

Three alkaline cleaning lines were visited for this study: two continuous operations and one batch operation. Table VII-1 provides a legend for the various control and treatment technology abbreviations used to describe the treatment components at these operations. Table VII-2 presents the raw wastewater and effluent monitoring data for the alkaline cleaning lines described above. The concentration values presented in Table VII-2 represent, except where footnoted, gross average values. In some cases these data were obtained from central treatment systems.

A brief discussion of each wastewater treatment system follows. Additional details for each wastewater system are presented in the respective flow diagrams.

Plant 152 (0176-01) - Figures VII-1 and VII-2

Wastewaters from alkaline cleaning operations are discharged to a complex central treatment system. The sources of wastewaters to the central treatment system are shown in Figure VII-1 and the schematic for the treatment system is shown in Figure VII-2. The alkaline cleaning wastewaters, which comprise approximately 1% of the total flow to the central treatment system, are discharged directly to the central treatment system without pretreatment.

These wastewaters are mixed with wastewaters from approximately twenty other sources and undergo equalization and neutralization, flocculation with polymers, and clarification with oil skimming. Sludge formed in the treatment process is dewatered in mechanical centrifuges. The effluent from this system is discharged to a receiving stream.

Plant 156 (0112I-04) - Figure VII-3

A complex central treatment system is also used at this plant. The alkaline cleaning wastewaters comprise less than 1% of the total flow. The alkaline cleaning solutions and rinses are combined with wastewaters from other sources and then undergo equalization, neutralization and primary clarification in a thickener. From the clarifier, the wastewaters enter a high-density-sludge (HDS) unit where the suspended solids and metals are removed. The overflow from the HDS unit is then filtered. The filtrate is discharged to a final polishing lagoon, where additional settling and temperature equalization is carried out prior to discharge to a receving stream.

Plant 157 and I (0432K) - Figure VII-4

The alkaline cleaning wastewaters from this line are also treated in a central treatment system. The two sources of wastewater from the alkaline cleaning operation are treated differently.

The rinsewater from the process is treated with rinsewaters from other process lines and undergoes neutralization and settling in lagoons prior to discharge. The spent cleaning solutions are collected and used to help neutralize spent pickle liquor generated in nearby pickle lines. After being mixed with the waste pickle liquor, the combined wastes enter the settling lagoons where some sedimentation occurs. The alkaline cleaning wastes at this plant make up less than 1% of the total flow to the central treatment system.

Effect of Make-up Water Quality

Where the mass loading of a limited pollutant in the make-up water to a process is small in relation to the raw waste loading of that pollutant, the impact of make-up water quality on wastewater treatment system performance is not significant, and, in many cases, not measureable. In these instances, the Agency has determined that the respective effluent limitations and standards should be developed and applied on a gross basis.

As shown in Table VII-3, untreated wastewaters from alkaline cleaning operations do not contain significant quantities of conventional or toxic pollutants. In some cases, these wastewaters are equivalent to make-up waters or water supplies in terms of the levels of suspended solids, oil and grease, and toxic metals. Thus, net credits may be appropriate for wastewaters from alkaline cleaning operations treated separately. However, since wastewaters from most alkaline cleaning operations are co-treated with wastewaters which have significant

levels of the limited pollutants for these subcategories, the Agency has determined that the limitations and standards should be applied on a gross basis for those alkaline cleaning operations with wastewaters treated in central systems, except to the extent provided by 40 CFR 122.63(h).

TABLE VII-1

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. **Operating Modes**

1. OT Once-Through

2. Rt,s,n Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn Blowdown, where n = discharge as % of raw waste flow

B. **Control Technology**

10. DI Deionization

11. SR Spray/Fog Rinse

12. CC Countercurrent Rinse

13. DR Drag-out Recovery

C. **Disposal Methods**

20. H Haul Off-Site

21. DW Deep Well Injection

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 2

C. **Disposal Methods (cont.)**

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. **Treatment Technology**

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 3

D. Treatment Technology (cont.)

43. FLt Flocculation, where t = type

t: L = Lime
A = Alum
P = Polymer
M = Magnetic
O = Other, footnote

44. CY Cyclone/Centrifuge/Classifier

44a. DT Drag Tank

45. CL Clarifier

46. T Thickener

47. TP Tube/Plate Settler

48. SLn Settling Lagoon, where n = days of retention time

49. BL Bottom Liner

50. VF Vacuum Filtration (of e.g., CL, T> or TP underflows)

51. Ft,m,h Filtration, where t = type
m = media
h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52. CLt Chlorination, where t = type

t: A = Alkaline
B = Breakpoint

53. CO Chemical Oxidation (other than CLA or CLB)

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 4

D. Treatment Technology (cont.)

54.	BOt	Biological Oxidation, where t = type t: An = Activated Sludge n = No. of Stages T = Trickling Filter B = Biodisc O = Other, footnote
55.	CR	Chemical Reduction (e.g., chromium)
56.	DP	Dephenolizer
57.	ASt	Ammonia Stripping, where t = type t: F = Free L = Lime C = Caustic
58.	APt	Ammonia Product, where t = type t: S = Sulfate N = Nitric Acid A = Anhydrous P = Phosphate H = Hydroxide O = Other, footnote
59.	DSt	Desulfurization, where t = type t: Q = Qualifying N = Nonqualifying
60.	CT	Cooling Tower
61.	AR	Acid Regeneration
62.	AU	Acid Recovery and Reuse
63.	ACt	Activated Carbon, where t = type t: P = Powdered G = Granular
64.	IX	Ion Exchange
65.	RO	Reverse Osmosis
66.	D	Distillation

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. **Treatment Technology (cont.)**

67.	AA1	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide

TABLE VII-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS ALKALINE CLEANING SUBCATEGORY

Raw Wastewaters

	Reference No.	0176-01		01121-04		0432K		Average	
	Plant Code	152		156		157			
	Sampling Point	V		C		C			
	Flow(gal/ton)	815		67		254		379	
	Type of Mill	Continuous		Batch		Continuous			
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Dissolved Iron	0.10	0.00034	0.34	0.000095	0.70	0.00074	0.38	0.00039
	Oil & Grease	8.0	0.027	9.0	0.0025	21.3	0.023	12.8	0.018
	Suspended Solids	3.5	0.012	11.0	0.0031	16.7	0.018	10.4	0.011
	pH, units	8.9-9.1		7.2-8.1		10.3-11.7		7.2-11.7	
36	2,6-Dinitrotoluene	ND	ND	ND	ND	0.047	0.000050	0.016	0.000017
39	Fluoranthene	ND	ND	0.0	0.0	0.051	0.000054	0.017	0.000018
84	Pyrene	ND	ND	0.0	0.0	0.032	0.000034	0.011	0.000011
114	Antimony	NA	NA	NA	NA	0.048	0.000051	0.048	0.000051
119	Chromium	<0.030	<0.00010	0.055	0.000015	0.20	0.00021	0.085	0.000075
121	Cyanide, Total	0.053	0.00018	0.003	Neg.	<0.001	<0.0000011	0.019	0.000060
122	Lead	0.040	0.00014	0.075	0.000021	<0.060	<0.000064	0.038	0.000054
124	Nickel	0.025	0.000085	0.015	0.0000042	<0.050	<0.000053	0.013	0.000030
125	Selenium	NA	NA	NA	NA	0.070	0.000074	0.070	0.000074
128	Zinc	0.015	0.000051	0.30	0.000084	0.049	0.000052	0.12	0.000062

Effluents

	Reference No.	0176-01(1)		01121-04		0432K	
	Plant Code	152		156		157	
	Sampling Point	(V/Z)(ZZ)		H		D	
	Flow(gal/ton)	815		67		254	
	C&TT	E,FLP,NC,NW,NA, CL,T,VF		E,NW,NL,T,FDS		NL,SL(UNK)	
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Dissolved Iron	0.8	0.0000012	0.045	0.000013	18.0	0.019
	Oil & Grease	4.5	0.0039	4.0	0.0011	4.0	0.0042
	Suspended Solids	16.5	0.00048	<1.0	<0.00028	91.7	0.097
	pH, units	7.2-7.9		7.3-7.7		5.6-6.7	
36	2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND
39	Fluoranthene	0.0	0.0	0.0	0.0	0.0	0.0
84	Pyrene	0.0	0.0	0.0	0.0	0.0	0.0
114	Antimony	NA	NA	NA	NA	0.038	0.000040
119	Chromium	0.18	Neg.	<0.03	<0.0000084	2.67	0.0028
121	Cyanide, Total	0.035	0.0025	0.002	Neg.	0.004	0.0000042
122	Lead	<0.05	0.00015	0.05	0.000014	<0.60	<0.00064
124	Nickel	1.35	0.0000088	0.015	0.0000042	6.0	0.0064
125	Selenium	<0.010	NA	NA	NA	<0.002	<0.0000021
128	Zinc	0.04	Neg.	0.13	0.000036	0.10	0.00011

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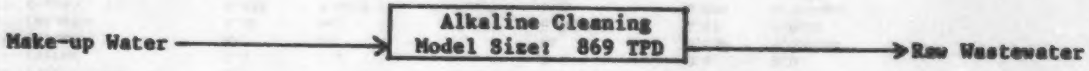
(1) The lbs/1000 lbs value for this operation cannot be derived directly from the concentrations and flow rates shown.

Neg : Less than 0.0000010 lbs/1000 lbs
Note: For a definition of C&TT codes, See Table VII-1.

ND: Not Reported
NA: Not Analyzed

TABLE VII-3

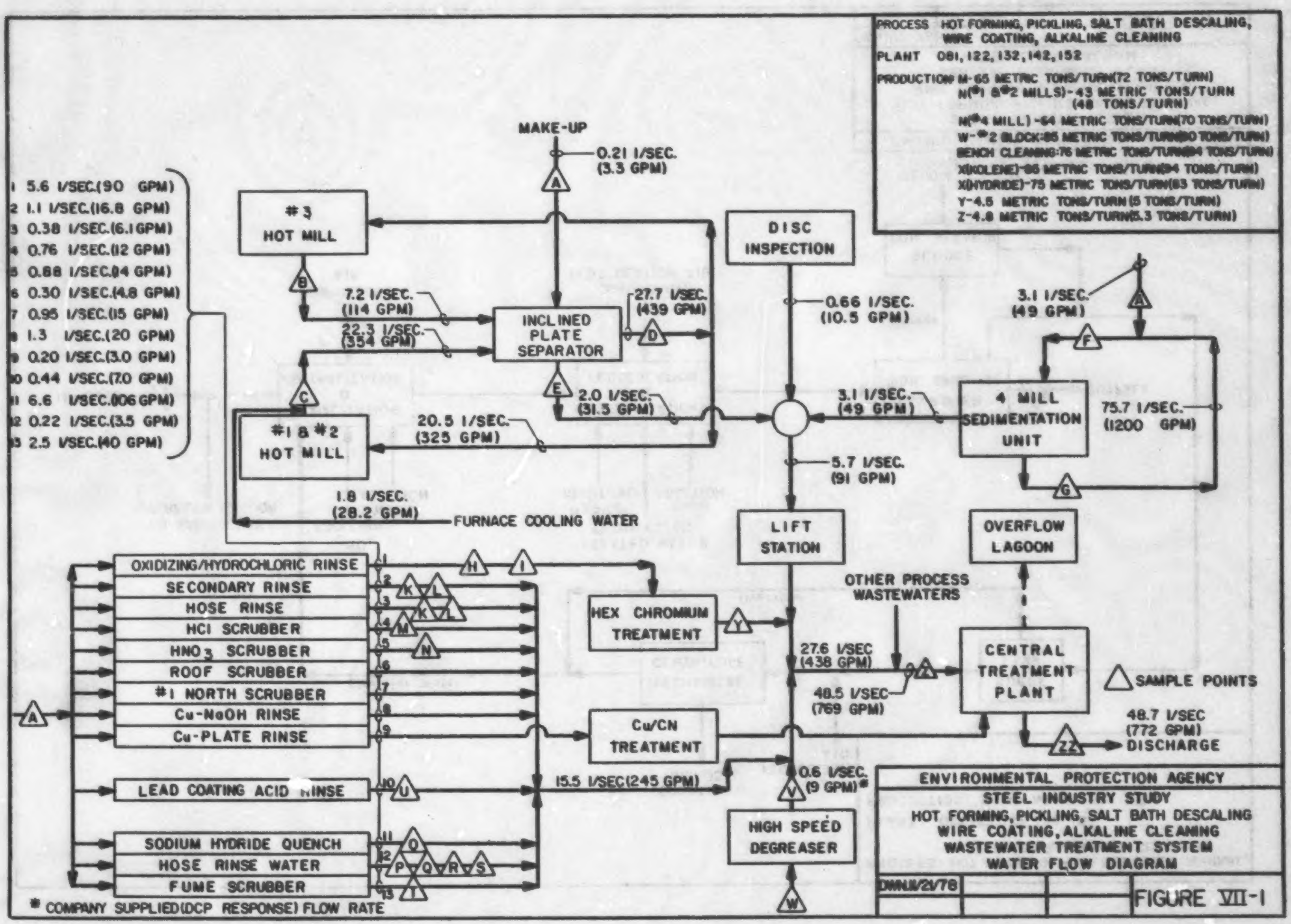
NET CONCENTRATION AND LOAD ANALYSIS
ALKALINE CLEANING


Make-up Water
Alkaline Cleaning
Model Size: 869 TPD
Raw Wastewater

869 TPD x 303 GPT = 263,307 GPD

869 TPD x 303 GPT = 263,307 GPD

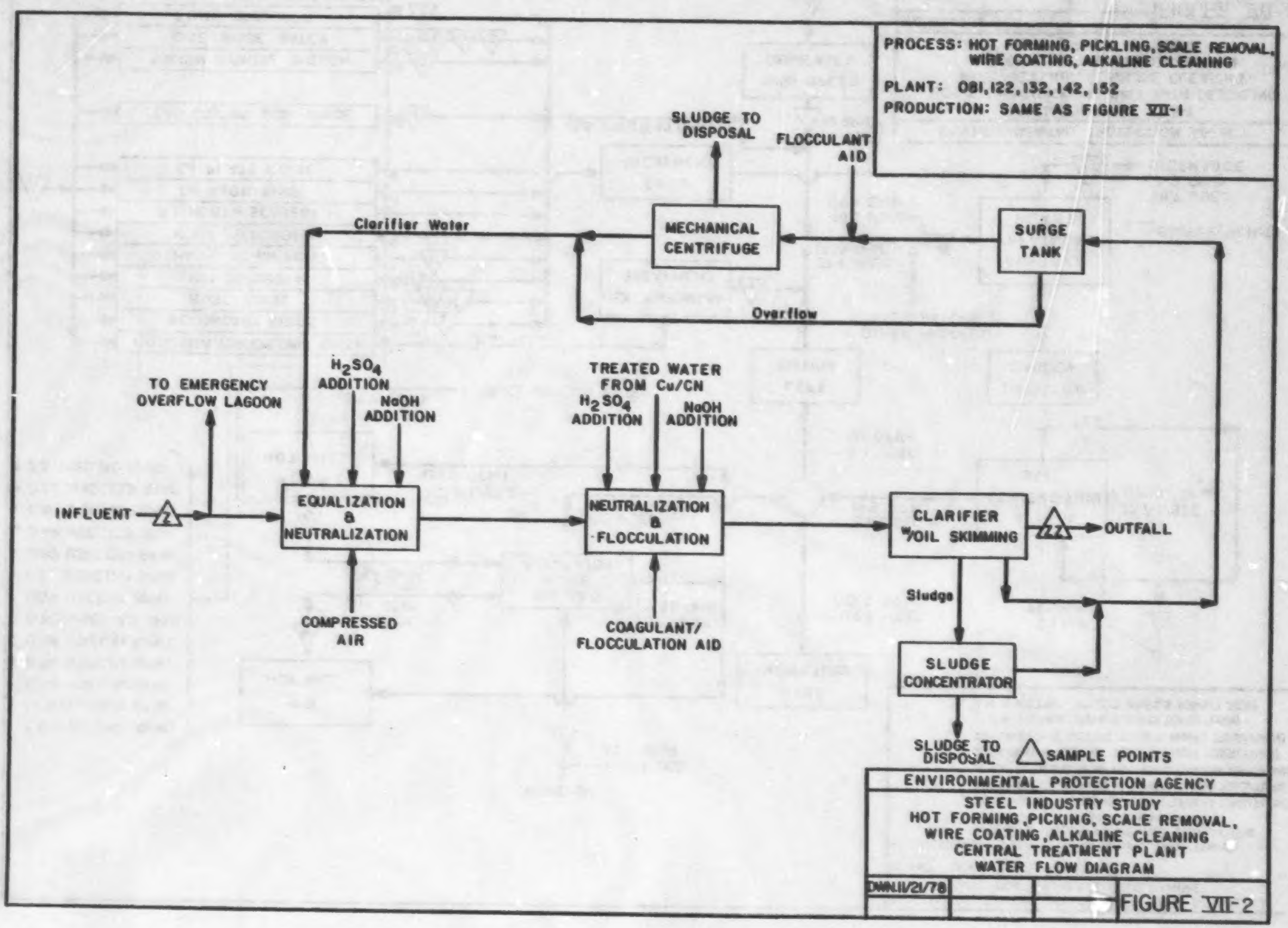
Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	2.0	13	5.0	10.98	20	43.92	25.00
Total Suspended Solids	< 1.0	51	12	26.35	10	21.97	120.00


PROCESS HOT FORMING, PICKLING, SALT BATH DESCALING, WIRE COATING, ALKALINE CLEANING
PLANT 081, 122, 132, 142, 152
PRODUCTION M-65 METRIC TONS/TURN(72 TONS/TURN)
N(#1 & #2 MILLS)-43 METRIC TONS/TURN (48 TONS/TURN)
N(#4 MILL)-64 METRIC TONS/TURN(70 TONS/TURN)
W-#2 BLOCK:85 METRIC TONS/TURN(90 TONS/TURN)
BENCH CLEANING:76 METRIC TONS/TURN(84 TONS/TURN)
X(KOLENE)-85 METRIC TONS/TURN(94 TONS/TURN)
X(HYDRIDE)-75 METRIC TONS/TURN(83 TONS/TURN)
Y-4.5 METRIC TONS/TURN (5 TONS/TURN)
Z-4.8 METRIC TONS/TURN(5.3 TONS/TURN)
1 5.6 l/SEC.(90 GPM)
2 1.1 l/SEC.(16.8 GPM)
3 0.38 l/SEC.(6.1 GPM)
4 0.76 l/SEC.(12 GPM)
5 0.88 l/SEC.(14 GPM)
6 0.30 l/SEC.(4.8 GPM)
7 0.95 l/SEC.(15 GPM)
8 1.3 l/SEC.(20 GPM)
9 0.20 l/SEC.(3.0 GPM)
10 0.44 l/SEC.(7.0 GPM)
11 6.6 l/SEC.(106 GPM)
12 0.22 l/SEC.(3.5 GPM)
13 2.5 l/SEC.(40 GPM)
MAKE-UP
0.21 l/SEC. (3.3 GPM)
A
#3 HOT MILL
B
7.2 l/SEC. (114 GPM)
22.3 l/SEC. (354 GPM)
INCLINED PLATE SEPARATOR
27.7 l/SEC. (439 GPM)
D
E
2.0 l/SEC. (31.5 GPM)
C
#1 & #2 HOT MILL
20.5 l/SEC. (325 GPM)
1.8 l/SEC. (28.2 GPM)
FURNACE COOLING WATER
DISC INSPECTION
0.66 l/SEC. (10.5 GPM)
3.1 l/SEC. (49 GPM)
5.7 l/SEC. (91 GPM)
3.1 l/SEC. (49 GPM)
F
4 MILL SEDIMENTATION UNIT
75.7 l/SEC. (1200 GPM)
G
LIFT STATION
OVERFLOW LAGOON
OTHER PROCESS WASTEWATERS
27.6 l/SEC (438 GPM)
48.5 l/SEC (769 GPM)
X
CENTRAL TREATMENT PLANT
SAMPLE POINTS
48.7 l/SEC (772 GPM) DISCHARGE
ZZ
OXIDIZING/HYDROCHLORIC RINSE
SECONDARY RINSE
HOSE RINSE
HCl SCRUBBER
HNO3 SCRUBBER
ROOF SCRUBBER
#1 NORTH SCRUBBER
Cu-NaOH RINSE
Cu-PLATE RINSE
LEAD COATING ACID RINSE
SODIUM HYDRIDE QUENCH
HOSE RINSE WATER
FUME SCRUBBER
1 2 3 4 5 6 7 8 9 10 11 12 13
H I K L K L M N U O P Q R S T
HEX CHROMIUM TREATMENT
Y
Cu/CN TREATMENT
15.5 l/SEC(245 GPM)
0.6 l/SEC. (9 GPM)*
V
HIGH SPEED DEGREASER
W
* COMPANY SUPPLIED(DCP RESPONSE) FLOW RATE
DWN.II/21/78

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING, PICKLING, SALT BATH DESCALING
WIRE COATING, ALKALINE CLEANING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

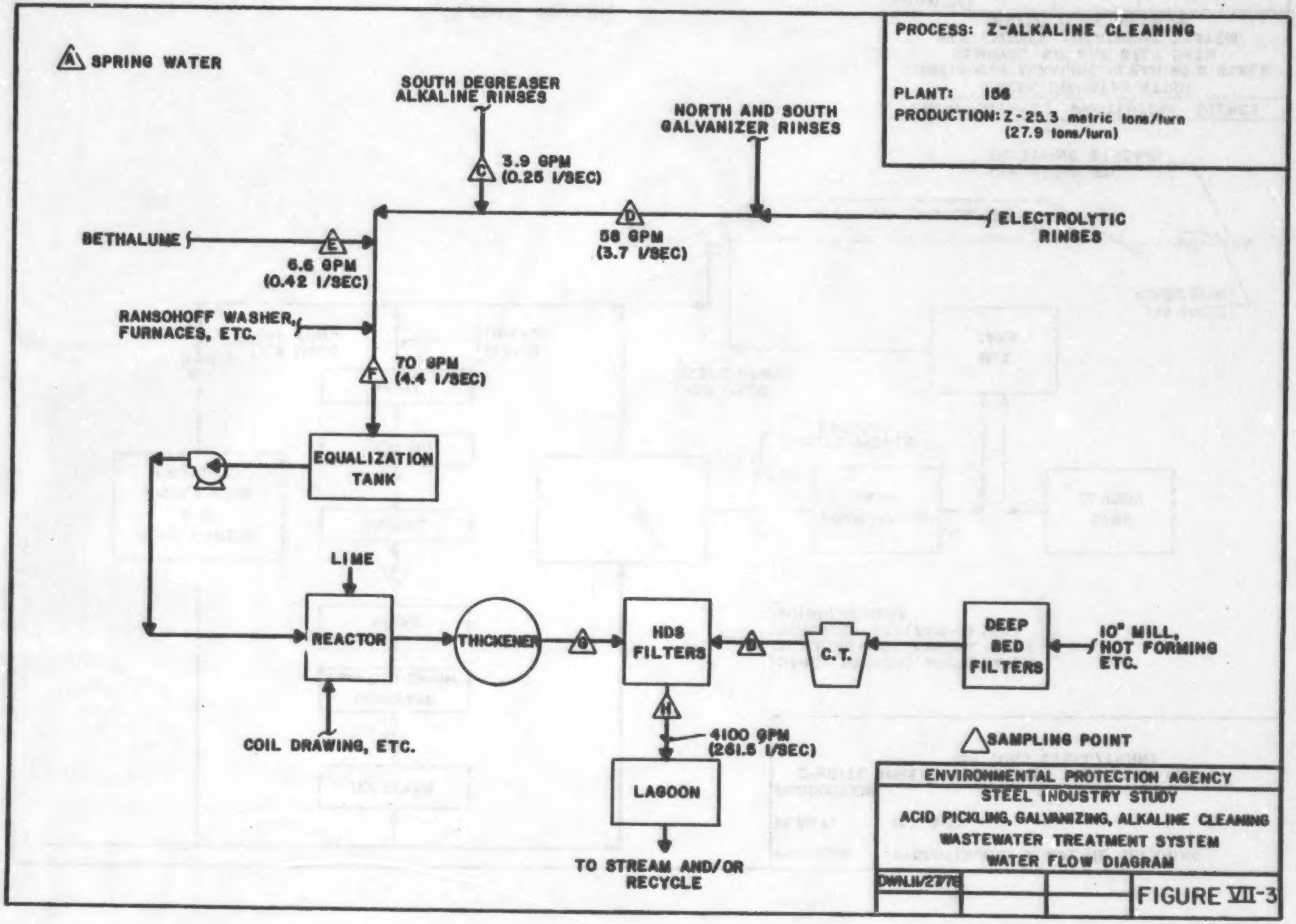
FIGURE VII-1


PROCESS: HOT FORMING, PICKLING, SCALE REMOVAL, WIRE COATING, ALKALINE CLEANING
PLANT: 081, 122, 132, 142, 152
PRODUCTION: SAME AS FIGURE VII-1
SLUDGE TO DISPOSAL
FLOCCULANT AID
MECHANICAL CENTRIFUGE
SURGE TANK
Clarifier Water
Overflow
TO EMERGENCY OVERFLOW LAGOON
H_2SO_4 ADDITION
NaOH ADDITION
TREATED WATER FROM Cu/CN
H_2SO_4 ADDITION
NaOH ADDITION
INFLUENT
2
EQUALIZATION & NEUTRALIZATION
NEUTRALIZATION & FLOCCULATION
CLARIFIER w/OIL SKIMMING
22
OUTFALL
COMPRESSED AIR
COAGULANT/ FLOCCULATION AID
Sludge
SLUDGE CONCENTRATOR
SLUDGE TO DISPOSAL
SAMPLE POINTS
DWN.11/21/78

ENVIRONMENTAL PROTECTION AGENCY

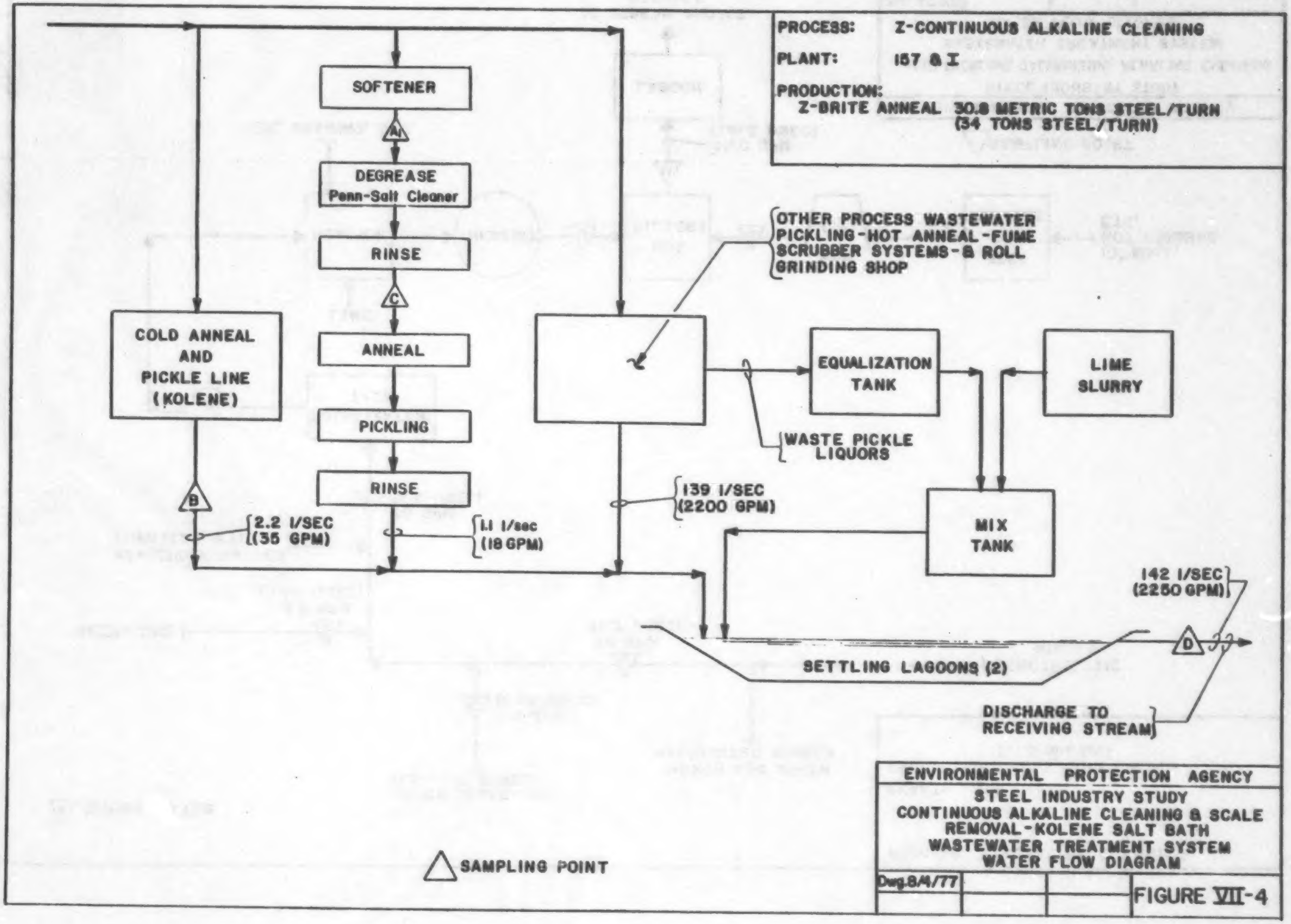
STEEL INDUSTRY STUDY
HOT FORMING, PICKING, SCALE REMOVAL,
WIRE COATING, ALKALINE CLEANING
CENTRAL TREATMENT PLANT
WATER FLOW DIAGRAM

FIGURE VII-2


PROCESS: Z-ALKALINE CLEANING
PLANT: 156
PRODUCTION: Z-25.3 metric tons/turn (27.9 tons/turn)
A SPRING WATER
SOUTH DEGREASER ALKALINE RINSES
C 3.9 GPM (0.25 l/SEC)
NORTH AND SOUTH GALVANIZER RINSES
D 58 GPM (3.7 l/SEC)
ELECTROLYTIC RINSES
BETHALUME
E 6.6 GPM (0.42 l/SEC)
RANSOHOFF WASHER, FURNACES, ETC.
F 70 GPM (4.4 l/SEC)
EQUALIZATION TANK
LIME
REACTOR
COIL DRAWING, ETC.
THICKENER
G
HDS FILTERS
B
C.T.
DEEP BED FILTERS
10" MILL, HOT FORMING ETC.
H
4100 GPM (261.5 l/SEC)
LAGOON
TO STREAM AND/OR RECYCLE
SAMPLING POINT
DWN.11/29/76

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
ACID PICKLING, GALVANIZING, ALKALINE CLEANING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-3


PROCESS: Z-CONTINUOUS ALKALINE CLEANING
PLANT: 157 & I
PRODUCTION:
Z-BRITE ANNEAL 30.8 METRIC TONS STEEL/TURN
(34 TONS STEEL/TURN)
SOFTENER
A
DEGREASE
Penn-Salt Cleaner
RINSE
C
ANNEAL
PICKLING
RINSE
1.1 l/sec
(18 GPM)
COLD ANNEAL
AND
PICKLE LINE
(KOLENE)
B
2.2 l/SEC
(35 GPM)
OTHER PROCESS WASTEWATER
PICKLING-HOT ANNEAL-FUME
SCRUBBER SYSTEMS-& ROLL
GRINDING SHOP
139 l/SEC
(2200 GPM)
WASTE PICKLE
LIQUORS
EQUALIZATION
TANK
LIME
SLURRY
MIX
TANK
142 l/SEC
(2250 GPM)
D
SETTLING LAGOONS (2)
DISCHARGE TO
RECEIVING STREAM
SAMPLING POINT
Dwg.8/4/77

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
CONTINUOUS ALKALINE CLEANING & SCALE
REMOVAL-KOLENE SALT BATH
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-4

ALKALINE CLEANING SUBCATEGORY

SECTION VIII

COST, ENERGY, AND NON-WATER QUALITY IMPACTS

Introduction

This section presents the incremental costs to the industry of applying the different levels of pollution control technology to the alkaline cleaning subcategory. The analysis also describes energy requirements, non-water quality impacts, and the techniques, magnitude and costs associated with application of the limitations and standards.

Actual Costs Incurred by the Operations Sampled or Solicited for This Study

The water pollution control costs reported by the industry for operations sampled during this study and for the operations for which D-DCP responses were received are presented in Table VIII-1. The costs were updated to July 1978 dollars from the data supplied for the plants at the time of sampling or from the data supplied in the D-DCP responses. Standard capital recovery factors were used to make the annual capital charges comparable. Also, where central treatment systems are present, the industry often supplied total cost data for the entire treatment system. The Agency analyzed these costs and estimated that portion attributable to alkaline cleaning operations as accurately as possible. Accordingly, only those costs due to the treatment of the alkaline cleaning wastes are listed.

Because of the extensive use of central treatment for alkaline cleaning wastewaters, the Agency could not directly verify its model-based cost estimates for separate treatment of alkaline cleaning wastewaters with cost data reported by the industry for central treatment systems. However, the Agency did compare its model-based separate treatment costs with industry costs for several central treatment systems by summing the model-based separate treatment costs for each subcategory included in the existing central treatment systems. The results of this comparison, presented in Volume I, demonstrate that the Agency's costing methodology accurately reflects industry costs for central treatment facilities in general, and for those systems including alkaline cleaning wastewaters in particular. In fact, as shown by the data presented in Volume I, the Agency's cost estimates for separate treatment for finishing operation wastewaters are likely to be significantly higher than actual costs incurred by industry for central treatment.

A descriptive summary of the model treatment system components considered is presented in Table VIII-2. The technologies described therein represent treatment alternatives either in use or available to alkaline cleaning operators. In addition to listing the treatment methods available, these tables also describe for each method:

1. Description of Treatment Step
2. Implementation Time
3. Land Requirements

Figures VIII-1 and VIII-2 illustrate the alternative treatment systems developed for batch and continuous alkaline cleaning operations.

Cost, Energy, and Non-water Quality Impacts

General Introduction

The installation of the alternative treatment systems involve additional expenditures of money and energy. The Agency also considered the effects of these systems on air pollution, water consumption, and solid waste disposal. The Agency estimated the cost and energy requirements based upon the treatment models developed in Sections IX through XIII. These cost estimates are presented below.

Estimated Costs for the Installation of Pollution Control Technologies

A. Costs Required to Achieve the BPT Limitations

Based upon the status of facilities as of July 1981, the Agency estimates that the industry will need to spend $0.6 million dollars (capital cost) to upgrade existing water pollution control facilities in the alkaline cleaning subcategory to achieve the BPT limitations. The total capital cost of BPT is about $12.3 million. Additionally, about $0.1 million of annual expenditures are required.

To develop the above costs, the Agency developed model treatment systems based upon average plant production and average water utilization rates (applied flow). The model BPT treatment system costs are presented in Tables VIII-3 and VIII-4 for batch and continuous operations, respectively. Plant by plant capital cost estimates were then made for each plant by factoring plant production to the model plant size by the "six-tenth" factor. This procedure yielded a cost estimate for the subcategory which the Agency believes is representative of the actual costs which the industry will incur. The cost comparisons presented in Volume I verify the accuracy of this costing methodology. Because the DCP responses listed the treatment components already installed in the subcategory, the Agency was able to separate total estimated costs into the cost of "in-place" components and the "cost required".

The cost estimates for this subcategory were developed with the assumption that separate wastewater treatment systems would be installed at each plant. If more than one line exists at a plant, the combined tonnage was used and one treatment system was costed for that plant. This methodology reduced somewhat the overstatement of costs in this subcategory. However, as pointed out earlier, wastewaters from all of the operations in this subcategory with treatment are treated in central treatment systems. Treating wastewaters in a central treatment system reduces costs because of economies of scale and because duplicate equipment components are not needed. Additionally, as the effluent data in Section VII indicate, plants that discharge wastewaters separately may not need to treat their wastewaters, except for neutralization to meet the pH limitations. Therefore, the Agency's estimates are believed to be conservative. Actual costs for this subcategory are expected to be less than the estimates presented above.

B. Costs Required to Achieve BAT Limitations

The Agency considered two BAT treatment systems based upon recycle of the BPT effluent and treatment of the blowdown. Alternative 1 is based upon filtration of the blowdown and Alternative 2 is based upon vapor compression distillation of the blowdown to achieve zero discharge. The model treatment costs associated with these alternatives are presented in Tables VIII-5 and VIII-6 for batch and continuous operations, respectively. The cost of BAT Alternatives 1 and 2 for the alkaline cleaning subcategory for the industry would amount to a capital investment of $7.6 and $57.7 million respectively. The annual expenditures associated with BAT Alternatives 1 and 2 would amount to $1.0 and $8.1 million, respectively. The Agency did not promulgate BAT limitations for alkaline cleaning operations.

C. Costs Required to Achieve BCT Limitations

The Agency has promulgated BCT limitations that are the same as the BPT limitations and can be achieved with the BPT model technology and facilities. Therefore, there will be no added cost beyond BPT to achieve compliance with the BCT limitations.

D. Costs Required to Achieve NSPS

The Agency considered two NSPS treatment systems for the alkaline cleaning subcategory. These treatment systems use the best and most efficient treatment components and applied water use rate demonstrated in the alkaline cleaning subcategory. These model treatment systems utilizes similar components as those comprising the BPT model treatment system as well as filtration. Model costs have been developed for the alternative NSPS treatment systems and are presented in Tables VIII-7 and VIII-8 for batch and continuous operations, respectively.

E. Costs Required to Achieve Pretreatment Standards

The Agency has not promulgated subcategory specific pretreatment standards for alkaline cleaning operations. Only the general pretreatment regulation, 40 CFR Part 403, will apply. Hence, there are no additional pretreatment costs associated with this regulation.

Energy Impacts

Very little energy would be required to operate the alternative treatment systems for alkaline cleaning operations considered by the Agency. The energy use at each level of treatment is presented below.

A. Energy Impacts at BPT

The Agency estimated the energy requirements for the BPT limitations based upon the assumption that all alkaline cleaning operations will install treatment systems similar to the model and that the operations will have discharge flows comparable to the model BPT flows. The Agency estimates that the BPT treatment systems for all alkaline cleaning operations will use approximately 3.5 million kilowatt-hours of electrical energy per year. This is less than 0.01% of the 57 billion kilowatts hours used by the steel industry in 1978.

B. Energy Impacts at BAT

Additional energy would be required due to the installation of the BAT model treatment systems. The electricity required per year and that amount expressed as a percent of the electricity used by the steel industry in 1978 for the two alkaline cleaning subdivisions are shown below.

Type of Operation	Energy (kwh/yr) BAT 1	Energy (kwh/yr) BAT 2	% of 1978 Industry Usage BAT 1	% of 1978 Industry Usage BAT 2
Batch	4,000	92,000	<0.001	<0.001
Continuous	8,000	1,768,000	<0.001	0.003

C. Energy Impacts at BCT

No additional energy will be required due to the installation of a BCT model treatment system, since it is the same as the model BPT treatment system.

D. Energy Impacts at NSPS

The energy required to achieve the NSPS and the annual costs for that electricity are shown below for the model size plants.

	Energy (kwh/yr)		Annual Cost ($)	
	NSPS-1	NSPS-2	NSPS-1	NSPS-2
Batch Operations	16,000	20,000	400	500
Continuous Operations	36,000	124,000	900	3,100

Non-water Quality Impacts

There are no significant air pollution, solid waste disposal, and water consumption impacts associated with the model treatment systems.

A. Air Pollution

There are no significant air pollution impacts associated with any of the treatment components considered for the alkaline cleaning subcategory.

B. Solid Waste Disposal

Sedimentation of alkaline cleaning wastewaters treated with wastewaters from other subcategories will result in the generation of sludge. However, since alkaline cleaning operations add little, if any, suspended solids to the wastewaters, no significant sludge generation is attributed to alkaline cleaning operations. Solid waste disposal impacts for those operations that are co-treated with alkaline cleaning operations are addressed in the respective subcategory reports for these operations.

There will be minimal solid waste disposal impacts at the NSPS level of treatment due to the low level of waste generation.

C. Water Consumption

Because none of the treatment systems considered for alkaline cleaning operations include cooling systems, little or no water consumption is anticipated due to the installation of the model treatment systems. Therefore, this consideration did not affect the selection of the model treatment system or the development of the effluent limitations and standards.

Summary of Impacts

While the Agency does not project significant effluent reduction benefits with the implementation of the BPT limitations for well operated and maintained alkaline cleaning operations, the effluent data acquired by the Agency show that alkaline cleaning operations can discharge significant levels of conventional pollutants, particularly when the spent alkaline solutions are being discharged. The Agency believes the minimal adverse impacts cited above are justified by the effluent reduction benefits resulting from the treatment of wastewaters from those plants discharging significant levels of pollutants and by the need to provide BPT effluent limitations for alkaline cleaning operations. These limitations should be consistent with the suspended solids and oil and grease BPT limitations for wastewaters from other finishing operations which are almost universally co-treated with alkaline cleaning wastewaters.

TABLE VIII-1

WATER POLLUTION CONTROL COSTS
ALKALINE CLEANING SUBCATEGORY

(All costs are expressed in July, 1978 dollars)

Plant Code:	152*	156*	157*	-
Reference Code:	0176-01	0112I-04	0432K	240B(01-04)
Initial Investment Cost	17,996	5,627	7,484	610,573
Annual Costs				
Capital	1,618	506	673	54,891
Operation and Maintenance	3,493	255	508	63,233
Energy, Power, Chemicals, etc.	206	10.5	NA	11,007
Other	-	16	-	5,714
TOTAL	5,317	788	881	134,845
$/Ton	1.70	0.15	0.03	**

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* : Estimated costs attributable to this subcategory. Costs were apportioned on the basis of flow.

**: This company has claimed its production as confidential information

Note: Capital are based upon the formula, Initial Investment x 0.0899.

TABLE VIII-2

CONTROL AND TREATMENT TECHNOLOGIES ALKALINE CLEANING SUBCATEGORY

C&TT Step	Description	Implementation Time (months)	Land Usage (ft^2)
A.	EQUALIZATION TANK WITH OIL SKIMMER - This treatment component provides normalization of the flow and wastewater characteristics, especially where batch dumps are common. The oil skimmer primarily removes floating oils.	3	225 (batch) 400 (continuous)
B.	ACID NEUTRALIZATION - Acid is added to the wastewater in a mixing tank to reduce the pH within the range of 6.0 to 9.0.	6	625
C.	POLYMER ADDITION - Polymer is added to the same mixing tank used in Step B. Polymer promotes solids flocculation and settling.	6	No additional space required.
D.	CLARIFIER - This treatment component allows the flocculated solids from Step C to settle out of the wastewater.	15-18	400 (batch) 1296 (continuous)
E.	VACUUM FILTER - Dewaters solids which settled in Step D. The filtrate is returned to Step D.	15-18	100 (batch) 400 (continuous)
F.	RECYCLE - Reduces the clarifier effluent by 90% and is returned to the process. This step decreases the final discharge flow and load.	12-15	625
G.	FILTER - Further reduces solids, oils, and some metallic compounds in the effluent from Step F.	15-18	500
H.	VAPOR COMPRESSION DISTILLATION - Vapor compression distillation concentrates the dissolved solids in the Step F effluent to a slurry consistency. This treatment produces a high quality distillate.	18-20	2025 (batch) 3025 (continuous)
I.	RECYCLE - This step recycles 100% of discharge from Step H to the process. Thus, zero discharge from the alkaline cleaning process is achieved.	12-15	No additional space required.

TABLE VIII-3

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Alkaline Cleaning
Subdivision: Batch

Model Size-TPD : 150
Oper. Days/Year: 250
Turns/Day : 2

C&TT Step	A	B	C	D	E	Total
Investment ($ x 10^{-3})	45.0	49.0	52.0	92.0	143.0	381.0
Annual Costs ($ x 10^{-3})						
Capital	4.0	4.4	4.7	8.3	12.9	34.3
Operation & Maintenance	1.6	1.7	1.8	3.2	5.0	13.3
Land					0.1(1)	0.1(1)
Sludge Disposal					0.1	0.1
Hazardous Waste Disposal						
Oil Disposal						
Energy & Power	0.1	0.1	0.2	0.2	0.9	1.5
Steam						
Waste Acid						
Crystal Disposal						
Chemical		0.2	0.3			0.5
TOTAL	5.7	6.4	7.0	11.7	19.0	49.8
Credits						
Scale						
Sinter						
Oil						
Acid Recovery						
TOTAL CREDITS						
NET TOTAL	5.7	6.4	7.0	11.7	19.0	49.8

---

(1): Total land requirement for model.

KEY TO C&TT STEPS

A: Equalization With Skimming
B: Neutralization With Acid
C: Polymer Addition
D: Clarification
E: Vacuum Filtration

TABLE VIII-4

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Alkaline Cleaning
Subdivision: Continuous

Model Size-TPD : 1,500
Oper. Days/Year: 250
Turns/Day : 2

C&TT Step	A	B	C	D	E	Total
Investment ($ x 10^{-3})	126.0	92.0	99.0	274.0	241.0	832.0
Annual Costs ($ x 10^{-3})						
Capital	11.3	8.3	8.9	24.6	21.7	74.8
Operation & Maintenance	4.4	3.2	3.5	9.6	8.4	29.1
Land					0.1(1)	0.1(1)
Sludge Disposal					1.3	1.3
Hazardous Waste Disposal						
Oil Disposal						
Energy & Power	0.2	0.3	0.2	0.4	1.3	2.4
Steam						
Waste Acid						
Crystal Disposal						
Chemical		2.9	4.1			7.0
TOTAL	15.9	14.7	16.7	34.6	32.8	114.7
Credits						
Scale						
Sinter						
Oil						
Acid Recovery						
TOTAL CREDITS						
NET TOTAL	15.9	14.7	16.7	34.6	32.8	114.7

---

(1): Total land requirement for model.

KEY TO C&TT STEPS

A: Equalization With Skimming
B: Neutralization With Acid
C: Polymer Addition
D: Clarification
E: Vacuum Filtration

TABLE VIII-5

BAT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Alkaline Cleaning
Subdivision: Batch

Model Size - TPD: 150
Oper. Days/Year : 250
Turns/Day : 2

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2			
		F	G	Total	F	H	I	Total
Investment ($ x 10^{-3})	381.0	25.5	12.1	37.6	25.5	803.1	11.9	840.5
Annual Costs ($ x 10^{-3})								
Capital	34.3	2.3	1.1	3.4	2.3	72.2	1.1	75.6
Operation & Maintenance	13.3	0.9	0.4	1.3	0.9	28.1	0.4	29.4
Land	0.1	0.1	0.1	0.2	0.1	0.1		0.2
Sludge Disposal	0.1							
Hazardous Waste Disposal								
Oil Disposal								
Energy & Power	1.5		0.1	0.1		2.3		2.3
Steam								
Waste Acid								
Crystal Disposal								
Chemical	0.5							
TOTAL	49.8	3.3	1.7	5.0	3.3	102.7	1.5	107.5
Credits								
Scale								
Sinter								
Oil								
Acid Recovery								
TOTAL CREDITS								
NET TOTAL	49.8	3.3	1.7	5.0	3.3	102.7	1.5	107.5

KEY TO C&TT STEPS

F: Recycle
G: Pressure Filtration
H: Vapor Compression Distillation
I: Recycle

TABLE VIII-6

BAT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Alkaline Cleaning
Subdivision: Continuous

Model Size - TPD: 1,500
Oper. Days/Year : 250
Turns/Day : 2

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2			
		F	G	Total	F	H	I	Total
Investment ($ x 10^{-3})	832.0	308.5	58.2	366.7	308.5	2,095.9	25.5	2,429.9
Annual Costs ($ x 10^{-3})								
Capital	74.8	27.7	5.2	32.9	27.7	188.4	2.3	218.4
Operation & Maintenance	29.1	10.8	2.0	12.8	10.8	73.4	0.9	85.1
Land	0.1	0.1	0.1	0.2	0.1	0.2		0.3
Sludge Disposal	1.3							
Hazardous Waste Disposal								
Oil Disposal								
Energy & Power	2.4		0.2	0.2		44.2		44.2
Steam								
Waste Acid								
Crystal Disposal								
Chemical	7.0							
TOTAL	114.7	38.6	7.5	46.1	38.6	306.2	3.2	348.0
Credits								
Scale								
Sinter								
Oil								
Acid Recovery								
TOTAL CREDITS								
NET TOTAL	114.7	38.6	7.5	46.1	38.6	306.2	3.2	348.0

KEY TO C&TT STEPS

F: Recycle
G: Pressure Filtration
H: Vapor Compression Distillation
I: Recycle

TABLE VIII-7

NSPS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Alkaline Cleaning
Subdivision: Batch

Model Size - TPD: 150
Oper. Days/Year : 250
Turns/Day : 2

C&TT Step	NSPS Alternative 1 A	B	C	D	E	Total	NSPS Alternative 2 Alternative 1 Plus: F	Total
Investment ($ x 10^{-3})	31.0	41.0	55.0	33.9	50.0	210.9	53.0	263.9
Annual Costs ($ x 10^{-3})								
Capital	2.8	3.7	4.9	3.0	4.5	18.9	4.8	23.7
Operation & Maintenance	1.1	1.4	1.9	1.2	1.8	7.4	1.9	9.3
Land				0.1	0.1	0.2		0.2
Sludge Disposal					0.3	0.3		0.3
Hazardous Waste Disposal								
Oil Disposal								
Energy & Power	0.1	0.1	0.1		0.1	0.4	0.1	0.5
Steam								
Waste Acid								
Crystal Disposal								
Chemical		0.1	0.1			0.2		0.2
TOTAL	4.0	5.3	7.0	4.3	27.4	27.4	6.8	34.2
Credits								
Scale								
Sinter								
Oil								
Acid Recovery								
TOTAL CREDITS								
NET TOTAL	4.0	5.3	7.0	4.3	6.8	27.4	6.8	34.2

KEY TO C&TT STEPS

A: Equalization with Skimming
B: Neutralization with Acid
C: Flocculation with Polymer
D: Clarifier
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-8

NSPS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

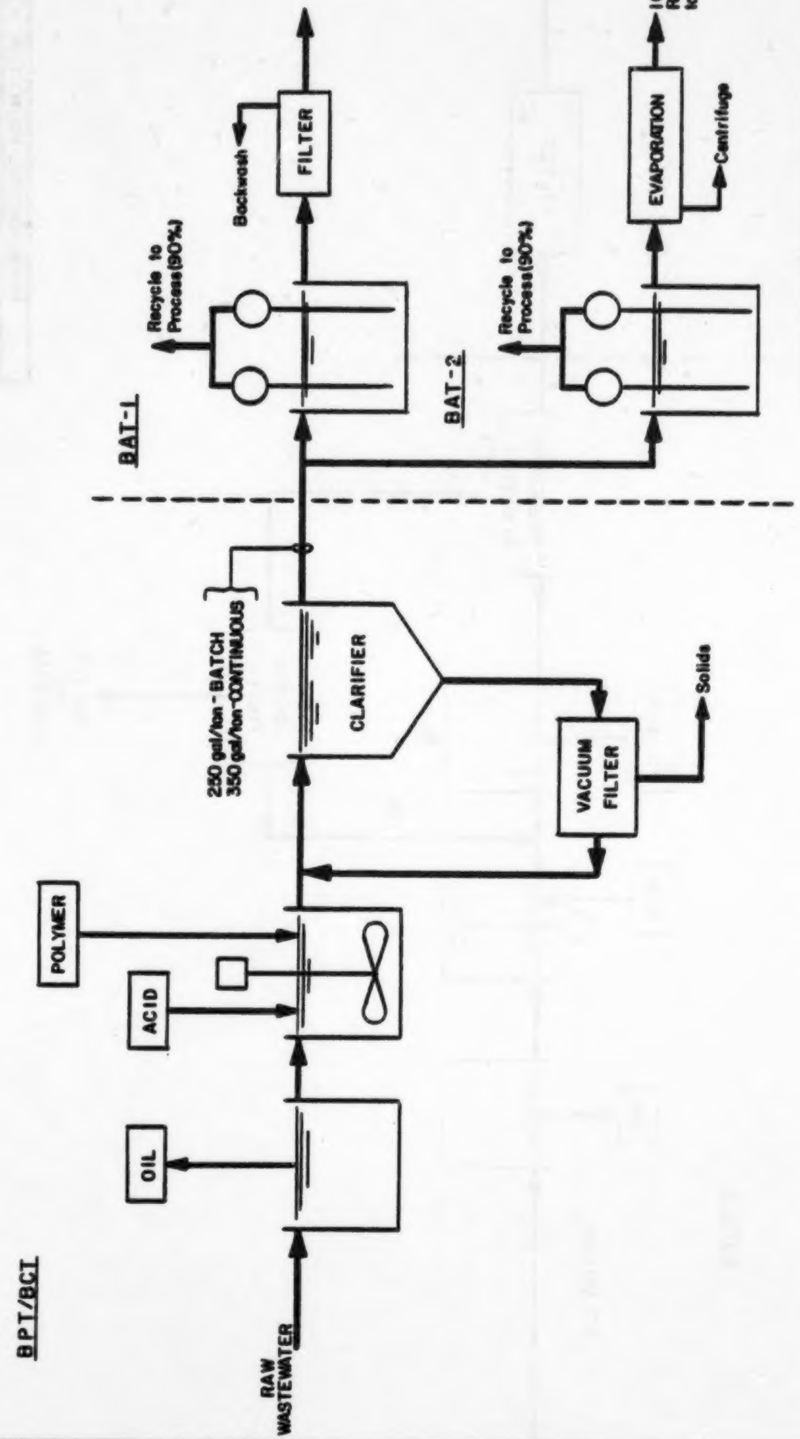
Subcategory: Alkaline Cleaning
Subdivision: Continuous

Model Size - TPD: 1,500
Oper. Days/Year : 250
Turns/Day : 2

C&TT Step	NSPS Alternative 1						NSPS Alternative 2 Alternative 1 Plus:	
	A	B	C	D	E	Total	F	Total
Investment ($ x 10^{-3})	56.0	56.0	72.0	99.8	145.0	428.8	189.0	617.8
Annual Costs ($ x 10^{-3})								
Capital	5.0	5.0	6.5	9.0	13.0	38.5	17.0	55.5
Operation & Maintenance	2.0	2.0	2.5	3.5	5.1	15.1	6.6	21.7
Land				0.1	0.1	0.2		0.2
Sludge Disposal					0.6	0.6		0.6
Hazardous Waste Disposal								
Oil Disposal								
Energy & Power	0.1	0.2	0.3		0.9	1.5	1.6	3.1
Steam								
Waste Acid								
Crystal Disposal								
Chemical		0.4	0.6			1.0		1.0
TOTAL	7.1	7.6	9.9	12.6	19.7	56.9	25.2	82.1
Credits								
Scale								
Sinter								
Oil								
Acid Recovery								
TOTAL CREDITS								
NET TOTAL	7.1	7.6	9.9	12.6	19.7	56.9	25.2	82.1

KEY TO C&TT STEPS

A: Equalization with Skimming
B: Neutralization with Acid
C: Flocculation with Polymer
D: Clarifier
E: Vacuum Filtration
F: Pressure Filtration

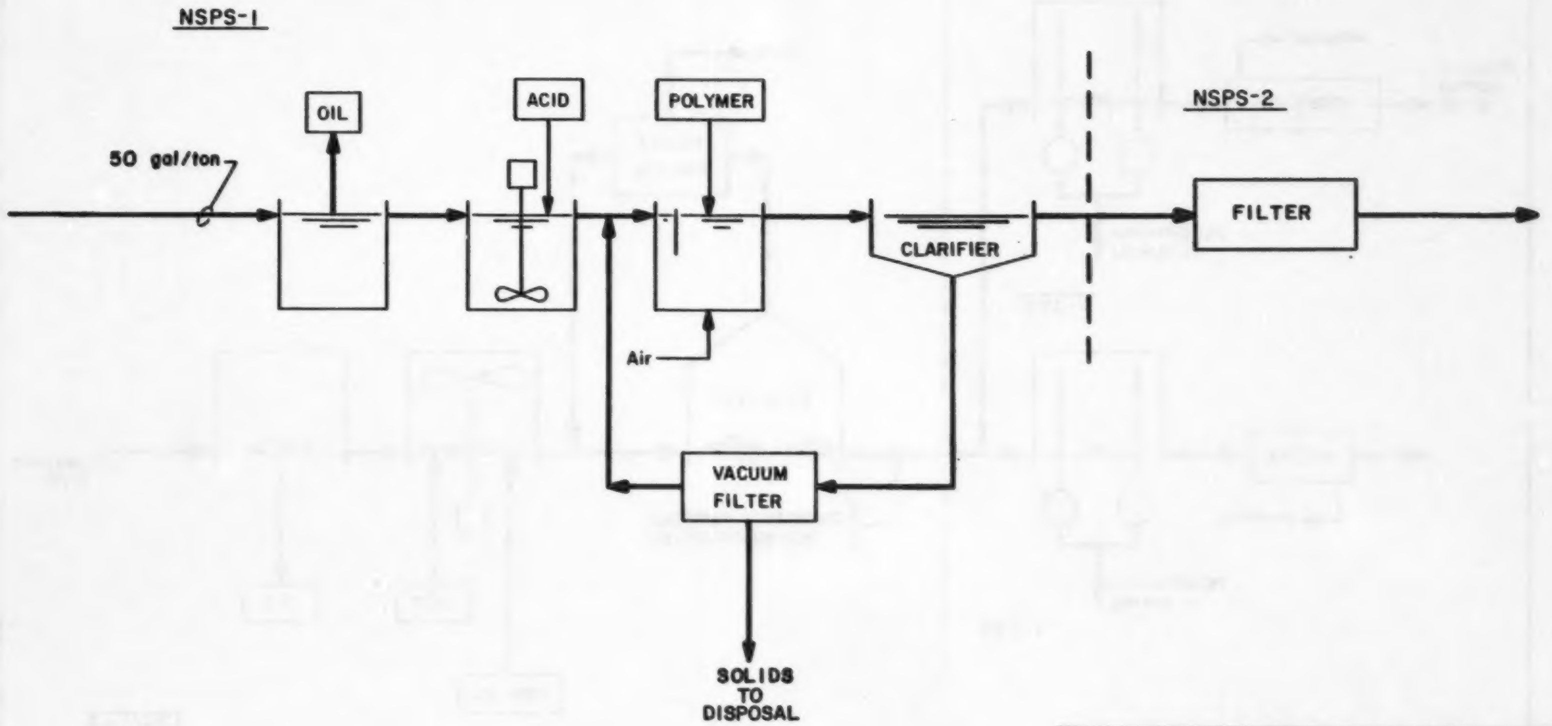

BPT/BCT
RAW WASTEWATER
OIL
ACID
POLYMER
CLARIFIER
VACUUM FILTER
Solids
250 gal/ton - BATCH
350 gal/ton - CONTINUOUS
BAT-1
Recycle to Process (90%)
Backwash
FILTER
BAT-2
Recycle to Process (90%)
EVAPORATION
Centrifuge
100% Recycle to Process

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING
BPT/BCT/BAT TREATMENT ALTERNATIVES

Dwn. 11/3/81

FIGURE VIII-1


NSPS-1
NSPS-2
50 gal/ton
OIL
ACID
POLYMER
Air
CLARIFIER
FILTER
VACUUM FILTER
SOLIDS TO DISPOSAL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING
NSPS MODEL

Dwn. 9/1/79

FIGURE VIII-2

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

Introduction

The Best Practicable Control Technology Currently Available (BPT) limitations were originally promulgated in March 1976.[1]

More stringent BPT limitations were proposed on January 7, 1981 (46 FR 1858). [2] Based upon comments received on the proposed regulation, the Agency has further studied alkaline cleaning operations and concluded that the originally promulgated limitations and the proposed limitations should be modified to reflect the impact that the different modes of operation have on rinse water flows.

In the originally promulgated regulation, the Agency established BPT limitations for dissolved iron, dissolved nickel, and dissolved chromium. During the toxic pollutant survey, the Agency did not find these pollutants in the raw wastewaters at levels treatable by any means other than recycle. Accordingly, the Agency is not promulgating limitations for those pollutants. A review of the model treatment processes and effluent limitations for the alkaline cleaning subcategory follows.

Identification of BPT

The BPT model treatment system includes the following wastewater treatment steps: equalization; oil skimming; neutralization with acid; and addition of a polymer followed by sedimentation in a flocculation-clarifier. The sludges generated in this system are dewatered by vacuum filters. The Agency believes that this treatment system is appropriate as the model treatment system for the BPT limitations, because it removes the conventional pollutants in this process wastewater and is consistent with the central treatment systems used by the industry to treat alkaline cleaning wastewaters and wastewaters from other steel finishing operations. Figure IX-1 depicts the model treatment system. The BPT limitations do not require the installation of the model treatment system; any treatment system which achieves the limitations is adequate.

---

[1] EPA 440/1-76/048-b, Development Document for Interim Final Effluent Limitations Guidelines and Proposed New Source Performance Standards for the Forming, Finishing and Specialty Steel Segment of the Iron and Steel Manufacturing Point Source Category.

[2] EPA 440/1-80/024b, Development Document for Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (6 Volumes)

Rationale for BPT

Treatment System

As noted in Section VII, each of the BPT model treatment system components is in use at a large number of alkaline cleaning operations.

Treatment Model Effluent Flows

Tables IX-1 and IX-2 present flow data for batch and continuous alkaline cleaning operations, respectively. The average of all lines is very similar; 1067 gal/ton for batch and 1140 gal/ton for continuous operations. Along with the average flow of all lines, the "average of the best" flows is presented on each table. The "average of the best" calculation is based upon flows from those lines which the Agency considers to be the best flows. In both types of operations, this calculation was the average of those flows of less than 1000 gal/ton. The Agency believes flow rates over 1000 gal/tons at alkaline cleaning operations do not reflect good water management practices. The resulting "average of the best" value was the basis for the 250 gal/ton for batch and 350 gal/ton for continuous BPT model effluent flows. For both types of alkaline cleaning operations processing all types of products, flow data from about 75 percent of the lines were used to develop the BPT model treatment system effluent flow rates. Thus, the Agency believes that product quality considerations should not affect the attainment of the model treatment system flow rates at any alkaline cleaning operations.

Effluent Quality

Tables A-6 and A-7 of Appendix A to Volume I present the basis for the model effluent concentrations used to develop the total suspended solids and oil and grease BPT limitations. The data presented in Appendix A are applicable to alkaline cleaning wastewaters. These concentrations are as follows:

	Daily Maximum	30 Day Average
Total Suspended Solids	70 mg/l	30 mg/l
Oil and Grease	30 mg/l	10 mg/l

BPT Limitations

The BPT limitations are presented below:

BPT Effluent Limitations
kg/kkg (lbs/1000 lbs) of Product

	Daily Maximum	30 Day Average
Batch		
TSS	0.0730	0.0313
Oil and Grease	0.0313	0.0104
pH	6.0 to 9.0	
Continuous		
TSS	0.102	0.0438
Oil and Grease	0.0438	0.0146
pH	6.0 to 9.0	

Demonstration of BPT Limitations

Table IX-3 presents sampled plant effluent data which support the BPT effluent limitations. Two of the three sampled plants achieved the limitations. With additional sedimentation or filtration, Plant 157 could also meet the BPT limitations. Since wastewaters from virtually all alkaline cleaning operations are treated in central treatment systems, it is not possible to demonstrate compliance with the limitations for stand alone operations. Additionally, as the data in Section VII indicate, alkaline cleaning operations discharging only rinsewater will be able to meet the effluent limitations with only sample pH adjustment (neutralization). Thus, the Agency believes that stand alone alkaline cleaning operations will be able to meet the BPT effluent limitations.

TABLE IX-1

ALKALINE CLEANING SUBCATEGORY
FLOW ANALYSIS AND BPT FLOW JUSTIFICATION
BATCH OPERATIONS

Model BPT Effluent Flow: 250 GPT

Plant Code	Discharge Flow (GPT)
0580G-10	8000 *
0580G-04	5000 *
0580G-11	4000 *
0580G-02	2000 *
0580A-03	1951 *
0068-01	1829 *
0548B-02	1290 *
0548	961
0580G-01	600
0460D	275
0460G	270
0068-03	236
0548B-01	216
0460H	170
0384A	168
0112I-04	67
0240B-03	53
0060N-01	42
0060N-02	42
0240B-02	28
0240B-01	24
0240C	7
0728	2

Average of all lines = 1067 GPT **
"Average of the best" lines = 236 GPT **

* Value was excluded from the "Average of the best" calculation.
** This average includes four confidential flow values which are not listed above.

TABLE IX-2

ALKALINE CLEANING SUBCATEGORY
FLOW ANALYSIS AND BPT FLOW JUSTIFICATION
CONTINUOUS OPERATIONS

Model BPT Effluent Flow: 350 GPT

Plant Code	Discharge Flow (GPT)	Plant Code	Discharge Flow (GPT)
0580A-01	16849 *	0860B-08	480
0580G-06	6000 *	0112A-09	421
0580G-07	6000 *	0528	387
0580G-08	6000 *	0864B-03	385
0580G-09	6000 *	02560-02	372
0580-01	4000 *	0920G-03	354
0580G-03	3750 *	0580-05	300
0580G-05	3750 *	0580B-01	300
0580A-02	3426 *	0580D-01	300
0580-02	1875 *	0864B-06	285
0860B-11	1835 *	0864B-01	267
0176-06	1763 *	0920L-01	266
0860B-02	1692 *	0432K	254
0580-04	1500 *	0864B-05	250
0580-03	1333 *	0864B-04	245
0580-07	1333 *	0868A-05	243
0860B-04	1210 *	0860B-10	231
0860B-03	1120 *	0112A-13	221
0176-03	1108 *	0856F-01	204
0868A-01	946	0948F-01	176
0860B-07	935	0868A-06	162
0112A-10	906	0580-06	150
0856E-01	894	0580B-02	150
0176-04	828	0580D-02	150
0176-01	815	0580E-01	150
0920G-01	776	0868A-04	133
0860B-01	766	0060D-02	109
0868A-07	762	0868A-03	96
0176-02	710	0760-01	88
0868A-02	701	02560-01	59
0068-02	693	0112A-14	15
0860B-05	649	0112A-12	13
0864B-02	595	0112A-11	12
0860B-06	567	0112A-15	12
0176-05	558	0584F-03	6
0920G-02	538	0584F-04	3
0112A-08	508	0584F-02	2
0584F-07	503	09200-01	1
0856E-04	487		

Average of all lines = 1140 GPT **
"Average of the best" lines = 351 GPT +

*: Value was excluded from the "Average of the best" calculation.
**: This average includes seven confidential flow values not listed above.
+: This average includes four confidential flow values not listed above.

TABLE IX-3

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
ALKALINE CLEANING SUBCATEGORY

	30-Day Average BPT Effluent Limitations (1)			
Operation	**TSS**	**O&G**	**pH**	**C&TT Components**
Batch	0.0313	0.0104	6-9	E,SS,NA,FLP,CL,VF
Continuous	0.0438	0.0146	6-9	E,SS,NA,FLP,CL,VF
Plant Discharge Data				
152(0176-01)	0.00048	0.0153	7.2-7.9	E,NC,NW, FLP,CL,VF
156(0112I-04)	<0.00028	0.0011	7.3-7.7	E,NW,NL, T,FDS

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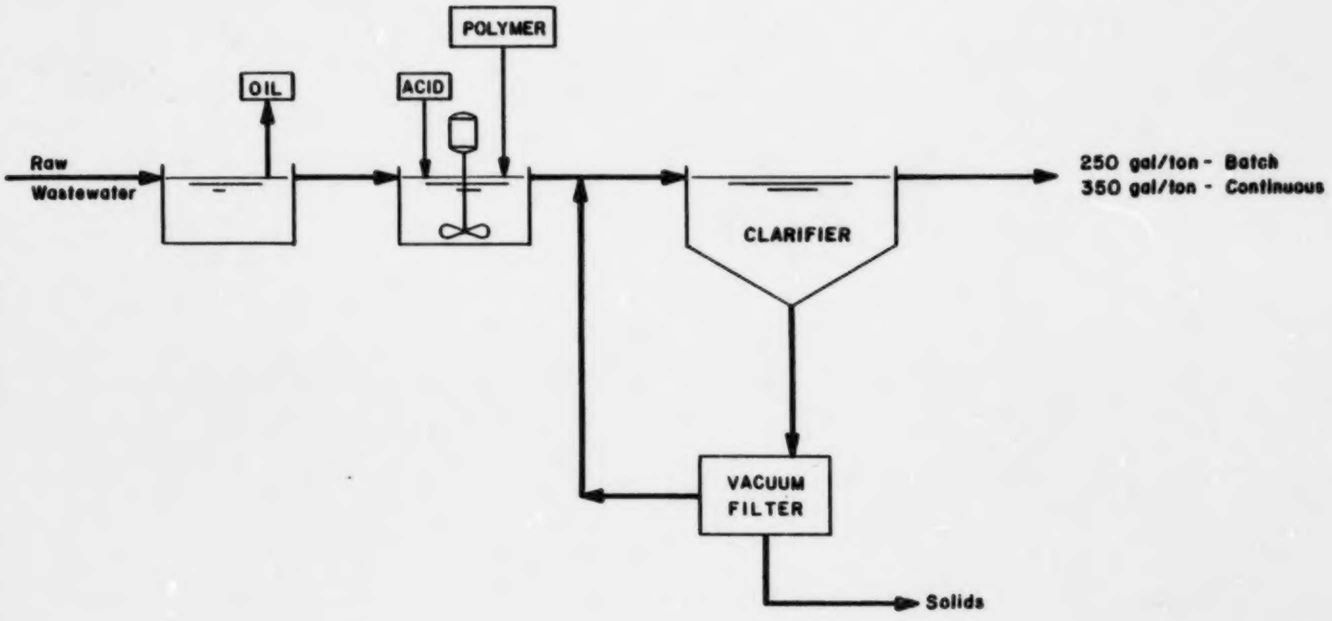
(1) kg/kkg of Product


Raw
Wastewater
OIL
ACID
POLYMER
CLARIFIER
250 gal/ton - Batch
350 gal/ton - Continuous
VACUUM
FILTER
Solids

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING
BPT MODEL

DWN. 6/10/80

FIGURE IX-1

ALKALINE CLEANING SUBCATEGORY

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

Introduction

As noted earlier, the toxic metals contained in alkaline cleaning process wastewaters are found at average levels of less than 0.15 mg/l. The discharge of these metals can only be reduced through waste volume reduction techniques including recycle and counter current rinse systems. Accordingly, the Agency considered two BAT model treatment systems, both of which incorporate 90% recycle. The blowdown from the recycle system would be further treated by filtration in BAT Alternative 1 and by vapor compression distillation in BAT Alternative 2. However, because the Agency could not find any direct recycle of alkaline cleaning wastewaters or counter-current rinse systems, and no significant quantities of toxic pollutants are present in these wastewaters, the Agency did not promulgate BAT limitations based upon these sytems.

BAT Alternatives

The BAT alternative treatment systems evaluated include recycle systems to reduce the BPT model flows of 250 gal/ton and 350 gal/ton for batch and continuous operations to 25 gal/ton and 35 gal/ton, respectively. Vapor compression distillation systems to achieve zero discharge by evaporating, condensing, and reusing the effluent from the recycle systems described above constitute the second alternative. Figure VIII-1 illustrates the two BAT treatment systems evaluated.

The effluent volumes and quality that could be achieved by these systems are as follows:

	Flow - (gal/ton)		Effluent Concentration (1) mg/l	
BAT Alternative	Batch	Continuous	Lead	Zinc
1	25	35	0.1	0.1
2	0	0	-	-

(1) Long term average; batch or continuous

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Selection of BAT

The Agency has determined that alkaline cleaning wastewaters do not contain significant quantities of toxic pollutants after compliance with applicable BPT limitations. Accordingly, since the BPT level of treatment provides adequate control, the Agency has not promulgated more stringent BAT limitations.

ALKALINE CLEANING SUBCATEGORY

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

Introduction

The 1977 Amendments added Section 301(b)(2)(E) to the Act establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(a)(4) [biochemical oxygen demanding pollutants (BOD_5), total suspended solids (TSS), fecal coliform, and pH] and any additional pollutants defined by the Administrator as "conventional" (oil and grease, 44 FR 44501, July 30, 1979).

BCT is not an additional limitation but replaces BAT for the control of conventional pollutants. In addition to other factors specified in section 304(b)(4)(B), the Act requires that BCT limitations be assessed in light of a two part "cost-reasonableness" test. American Paper Institute v. EPA, 660 F.2d 954 (4th Cir. 1981). The first test compares the cost for private industry to reduce its conventional pollutants with the costs to publicly owned treatment works for similar levels of reduction in their discharge of these pollutants. The second test examines the cost-effectiveness of additional industrial treatment beyond BPT. EPA must find that limitations are "reasonable" under both tests before establishing them as BCT. In no case may BCT be less stringent than BPT.

EPA published its methodology for carrying out the BCT analysis on August 29, 1979 (44 FR 50732). In the case mentioned above, the Court of Appeals ordered EPA to correct data errors underlying EPA's calculation of the first test, and to apply the second test. (EPA had argued that a second cost test was not required.

Because of the remand in American Paper Institute v. EPA (No. 79-115), the Agency did not promulgate BCT limitations except for those operations for which the BAT limitations are no more stringent than the respective BPT limitations. Alkaline cleaning is one of the subcategories where BAT was promulgated equal to BPT. The Agency has concluded that BCT limitations more stringent than BPT are not appropriate. No additional cost for compliance with BCT is anticipated in this subcategory.

ALKALINE CLEANING SUBCATEGORY

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS

Introduction

NSPS are to represent the degree of effluent reduction achievable through the application of the best available demonstrated control technology (BDT), processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants. At this time, however, zero discharge is not a feasible treatment alternative for the alkaline cleaning subcategory. As discussed in Section VII, except for evaporative systems, there are no technologies which could be applied to all operations in this subcategory to attain zero discharge of process wastewater pollutants. Evaporative technologies are energy intensive and not demonstrated in this subcategory, or in this industry.

Identification of NSPS Alternatives

The Agency has selected two NSPS alternative treatment systems based on the best flow (gal/ton) and the best treatment components demonstrated in the alkaline cleaning subcategory.

A. NSPS Alternative 1

This treatment alternative is similar to the BPT model treatment system and is shown in Figure VIII-2. The treatment components include equalization with oil skimming, neutralization with acid, and flocculation with polymer. Clarification provides solids removal, followed by vacuum filtration for dewatering the sludge collected in the clarifier.

B. NSPS Alternative 2

This treatment alternative includes the treatment alternatives comprising NSPS-1 with the addition of filtration. This alternative is also shown in Figure VIII-2.

The NSPS corresponding to these two alternatives are shown in Table XII-1. Respective capital and annual costs for these alternatives appear in Tables VIII-7 and VIII-8 for batch and continuous operations, respectively.

Rationale for the Selection of NSPS

The NSPS treatment alternatives include those components which achieve the most significant removal of toxic and conventional pollutants.

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The Agency considered various other NSPS alternative treatment systems including those which achieve zero discharge. However, these systems were generally too costly. The rationale for the NSPS alternative treatment systems and the flow and effluent concentrations follows.

Alternative Treatment Systems

Both NSPS treatment alternatives include standard chemical addition and sedimentation. In addition, NSPS-2 includes filtration equipment. All of these treatment components are well demonstrated in this and other steel industry subcategories. Equalization is used to reduce fluctuations in flow and pollutant concentrations, so that subsequent treatment components will operate more effectively. Oil skimming is provided to reduce any floating oils that may be present in the wastewaters. Acid is added in a reaction tank to neutralize the pH of the incoming wastewater to within the required range of 6.0 to 9.0. The neutralization step is followed by polymer addition; polymer is added to aid solids and metals removal. The polymer addition is carried out in a mixing tank to provide proper contact between the solids and the polymer.

After chemical addition, the wastewaters undergo preliminary sedimentation prior to filtration. A clarifier is used in the alternatives, since this unit will reduce suspended solids to a level which will not interfere with the filtration equipment. Following sedimentation the wastewaters are filtered to remove additional particulate matter and oils. Filtration was chosen as a final step, because it is demonstrated in the steel industry and because it is effective at reducing the levels of solids, oils, and metals. The cost estimates for the filtration system were based upon a multi-media pressure filter. This type of filter is most often used in the steel industry. However, other types of filtration systems can be used to treat alkaline cleaning wastewaters.

Flows

Batch and Continuous Operations

A model discharge flow of 50 gal/ton for both batch and continuous operations is the basis for the NSPS. This flow is demonstrated at several batch and continuous operations. Seven batch operations (approximately 26% of the batch operations submitting flow data) and nine continuous operations (approximately 11% of the continuous operations submitting flow data) demonstrate the model flow of 50 gal/ton. Table XII-2 presents a list of these plants and the respective flow rates on a gallons per ton basis.

Pollutants

The Agency selected total suspended solids, oil and grease, and pH as the pollutants to be limited at NSPS. Oil and grease was included to provide control of the oils removed from the product in the alkaline cleaning process. Also, oil and grease is limited in numerous steel finishing operations. Therefore, the addition of oil and grease to the list of limited pollutants will facilitate the development of combined standards for treatment systems. Finally, pH is limited to ensure that the wastewaters are properly neutralized.

Effluent Concentrations

The alternative NSPS for the above treatment systems are presented in Table XII-1. Refer to Sections IX and X for information concerning clarification and filtration effluent concentration levels.

Selection of NSPS

The Agency selected NSPS Alternative 1 as the basis for NSPS. The Agency has promulgated NSPS for alkaline cleaning operations based upon the best demonstrated flows noted above, and, in order to facilitate co-treatment of new source alkaline cleaning wastewaters with wastewaters from other new source steel finishing operations, effluent quality for total suspended solids and oil and grease consistent with those used to develop NSPS for other subcategories. These standards are achievable by the model treatment technology. (See discussion in Section IX and Appendix A of Volume I). These concentrations are the same as those used to develop the BPT limitations for alkaline cleaning operations. The promulgated NSPS are presented in Table XII-3. This table also lists plants that demonstrate the NSPS. The NSPS model treatment system is shown in Figure XII-1.

TABLE XII-1

NEW SOURCE PERFORMANCE STANDARDS
ALKALINE CLEANING SUBCATEGORY

		Batch & Continuous Operations	
NSPS-1		Concentration Basis (mg/l)	Effluent Standards (kg/kkg of Product)
Discharge Flow (Gal/Ton)			50
Total Suspended Solids	Ave.	30	0.00626
	Max.	70	0.0146
Oil & Grease	Ave.	10	0.00209
	Max.	30	0.00626
pH, Units		Within the range of 6.0 to 9.0	
NSPS-2			
Discharge Flow (Gal/Ton)			50
Total Suspended Solids	Ave.	15	0.00313
	Max.	40	0.00834
Oil & Grease	Ave.	-	-
	Max.	10	0.00209
pH, Units		Within the range of 6.0 to 9.0	

TABLE XII-2

OPERATIONS DEMONSTRATING THE NSPS DISCHARGE FLOW RATE ALKALINE CLEANING SUBCATEGORY

Model NSPS Flow: 50 GPT

Batch		Continuous	
Plant Code	Discharge Flow (GPT)	Plant Code	Discharge Flow (GPT)
0060N-01	42	0112A-14	15
0060N-02	42	0112A-12	13
0240B-02	28	0112A-11	12
0240B-01	24	0112A-15	12
0240C	7	0584F-03	6
0728	2	0584F-04	3
		0584F-02	2
		0584F-01	1

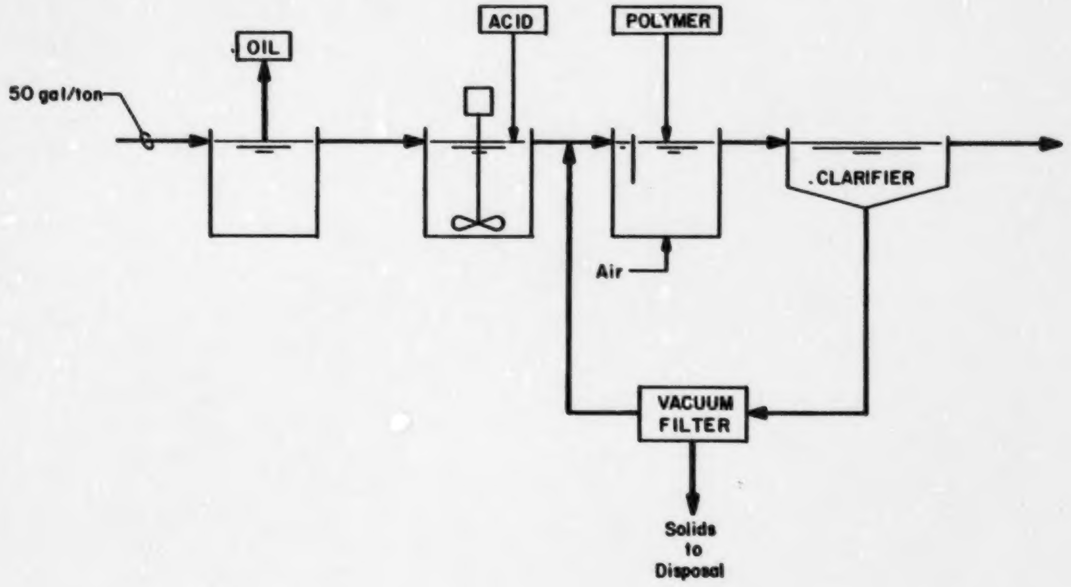
NOTE: The flow data for confidential operations are not listed.

TABLE XII-3

JUSTIFICATION OF NSPS
ALKALINE CLEANING SUBCATEGORY

	30-Day Average NSPS (kg/kkg of Product)		
	TSS	Oil & Grease	pH
All Operations	0.00626	0.00209	6.0 - 9.0
Operations Achieving the NSPS			
152 0176-01	0.00048	**	7.2 - 7.9
156 0112I-04	<0.00028	0.0011	7.3 - 7.7

**: Standard is not supported.


50 gal/ton
OIL
ACID
POLYMER
Air
CLARIFIER
VACUUM FILTER
Solids to Disposal

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING
NSPS MODEL

Dwn. 9/1/79

FIGURE XII-1

ALKALINE CLEANING SUBCATEGORY

SECTION XIII

PRETREATMENT STANDARDS FOR DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS

Introduction

The Agency has not promulgated pretreatment standards for alkaline cleaning operations. Instead, the General Pretreatment Regulations, 40 CFR Part 403, will apply. The general pretreatment and categorical pretreatment standards applying to alkaline cleaning operations are discussed below.

General Pretreatment Standards

For detailed information on Pretreatment Standards, refer to 46 FR 9404 et seq, "General Pretreatment Regulations for Existing and New Sources of Pollution," (January 28, 1981). See also 47 FR 4518 (February 1, 1982). In particular, 40 CFR Part 403 describes national standards (prohibited discharges and categorical standards), revision of categorical standards, and POTW pretreatment programs.

In considering pretreatment standards for alkaline cleaning operations, the Agency gave primary consideration to the objectives and requirements of the General Pretreatment Regulations.

Rationale

As discussed throughout this report, toxic pollutants are present in untreated alkaline cleaning wastewaters at levels below or near treatability levels of course, the conventional pollutants will receive comparable treatment in the POTW. Hence, the Agency has not promulgated pretreatment standards for new or existing alkaline cleaning operations.

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HOT COATING SUBCATEGORY

SECTION I

PREFACE

The USEPA has promulgated effluent limitations and standards for the iron and steel industry pursuant to Sections 301, 304, 306, 307 and 501 of the Clean Water Act. The regulation contains effluent limitations guidelines for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS).

This part of the Development Document highlights the technical aspects of EPA's study of the Hot Coating Subcategory of the Iron and Steel Industry. Volume I of the Development Document addresses general issues pertaining to the industry while other volumes contain specific subcategory reports.

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HOT COATING SUBCATEGORY

SECTION II

CONCLUSIONS

Based upon this current study, a review of previous studies, and comments received on the regulation proposed on January 7, 1981 (46 FR 1858), the Agency has reached the following conclusions.

1. The Agency has established separate limitations for rinse water discharges and discharges from fume scrubbers for hot coating operations. The original subdivision of this subcategory is being retained for rinsewater discharges. A separate subdivision has been established for fume scrubber discharges.

2. The limitations for hot coating operations contained in the 1976 regulation were applicable to galvanizing and terne-coating operations only. This regulation contains limitations for galvanizing, terne, and hot coating operations applying other metals. Coating metals identified as part of the other metals subdivision include aluminum, lead, and tin, along with combinations of these metals or combinations with zinc.

3. The Agency concluded that the model wastewater flow rates used to develop the previously promulgated BPT limitations for the strip, sheet and miscellaneous products subdivision are appropriate irrespective of the type of coating applied. The model wastewater flow rates for operations coating nails, fasteners and wire products were increased to reflect the larger data base available to the Agency during this study.

4. The concentration basis for the effluent limitations has been revised for all pollutants to reflect additional effluent data acquired as part of this study. Except for hexavalent chromium, which remains unchanged, the concentration bases are more stringent than those used to develop limitations contained in the 1976 regulation.

5. An allowance for fume scrubber wastewaters has again been provided. The Agency has concluded that the applied flow rates for fume scrubbers are not related to product type, production rate, or air flow through the scrubber. Therefore, daily mass limitations (kg/day) have been promulgated for fume scrubbers. These limitations are to be added to the limitations for the rinsewaters, where fume scrubbers are installed.

6. The Agency has promulgated BPT effluent limitations for total suspended solids, oil and grease, pH, lead, and zinc for all hot coating subdivisions. Limitations for hexavalent chromium have also been promulgated for those galvanizing lines that include

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chromate dip and rinse steps. The Agency believes that these limitations will control the discharges of other toxic pollutants found in hot coating wastewaters.

7. The Agency promulgated BAT limitations for toxic pollutants (lead, zinc and hexavalent chromium) that are the same as the BPT limitations for the subdivisions covering rinsewater discharges. The Agency found that conventional rinsewater flow reduction methods may not be appropriate for all coating operations, and that technologies evaluated for toxic metals removal beyond that provided by the model BPT treatment systems either provide only marginal incremental removal or cannot be readily retrofitted at all existing operations. For the fume scrubber subdivision, the promulgated BAT limitations are 15 percent of the corresponding BPT limitations. These limitations are based upon an 85 percent reduction in fume scrubber wastewater discharge achieved through recycle.

8. The Agency has promulgated BCT limitations for conventional pollutants (TSS and oil and grease) which are the same as the BPT limitations for these pollutants.

9. A summary of the effluent loadings remaining after implementation of BPT, BCT, BAT and PSES follows:

	Direct Discharge Loadings (Tons/Yr)		
	Raw Waste	BPT/BCT	BAT
Flow, MGD	22.9	22.8	18.3
TSS	2,658	588	471
Oil and Grease	1,060	109	87.0
Toxic Metals	1,829	12.2	9.8

	Indirect Discharge Loadings (Tons/yr)	
	Raw Waste	PSES
Flow, MGD	7.5	5.6
TSS	612	142
Oil and Grease	217	26.3
Toxic Metals	269	3.0

10. Based upon facilities in place as of July 1, 1981, the Agency estimates the following costs to the industry will result from compliance with the BPT and BAT limitations and PSES for the hot coating subcategory. The Agency has determined that the effluent reduction benefits associated with compliance with the effluent limitations and standards justify the costs presented below:

Costs (Millions of July 1, 1978 Dollars)

	Investment Costs			Annual Costs		
	Total	In-Place	Required	Total	In-Place	Required
BPT	33.7	29.1	4.60	5.07	4.31	0.76
BAT	0.87	0.36	0.51	0.12	0.05	0.07
PSES	5.05	2.68	2.37	0.74	0.39	0.35

The Agency has also determined that the effluent reduction benefits associated with compliance with new source standards (NSPS, PSNS) justify those costs.

11. The Agency has promulgated NSPS that are 25 percent of the BPT and BAT limitations for the subdivisions covering rinsewater discharge. These standards are based upon the same model treatment system, except that rinsewater discharges are reduced by use of cascade rinsing. NSPS for the fume scrubber subdivision are the same as the corresponding BAT limitations.

12. The Agency has promulgated pretreatment standards covering new and existing sources (PSNS and PSES) that discharge wastewaters to POTWs. The PSES are the same as the BAT limitations, while the PSNS are the same as the NSPS. The standards are based upon the same model treatment systems.

13. With regard to the remand issues, the Agency found with respect to hot coating operations that:

    a. Age does not significantly affect either the cost or the ability to retrofit pollution control equipment to existing production facilities. The Agency did, however, find that it may not be feasible to retrofit cascade rinse systems at all existing hot coating lines, because of configuration and space limitations.

    b. Its estimates of the cost of installing the model wastewater treatment systems are sufficient to cover site-specific conditions. The Agency compared its model based cost estimates with actual costs reported by the industry. The comparison showed that the Agency's cost estimates exceeded the reported costs by 49 percent. The costs provided by the industry included site specific and retrofit costs. Hence, the Agency concludes that its model-based cost estimates are sufficient to cover site-specific and retrofit costs. For more detail on cost comparisons refer to Section VIII.

    c. The impact of these limitations and standards upon water consumption is insignificant. The recycle components of the model treatment systems do not elevate the temperature of the water to the point where evaporation becomes significant.

14. The Agency received comments from a small segment of the industry suggesting that limitations should be based upon the basis of a load per surface area coated rather than on load per production weight basis. The Agency found that the available surface area data was insufficient, since such records are not usually kept by the industry and the Agency does not have an adequate data base to develop limitations and standards on the basis of surface area. Moreover, the Agency believes that its method of establishing limitations and standards on the basis of quantity of product (kg/kkg) is appropriate.

15. Table II-1 presents the treatment model flow and effluent quality data used to develop the BPT and BCT effluent limitations for the hot coating subcategory, and Table II-2 presents these limitations. Table II-3 presents the treatment model flow and effluent quality data used to develop the BAT effluent limitations and the NSPS, PSES, and PSNS for the hot coating subcategory. Table II-4 presents these limitations and standards.

TABLE II-1

BPT and BCT TREATMENT MODEL FLOWS AND EFFLUENT QUALITY
HOT COATING SUBCATEGORY

	30-Day Average Concentration(1)		
	Galvanzing, Terne & Other Metal Coating Subdivision		Fume Scrubber Subdivision
	Strip, Sheet & Miscellaneous	Wire Products & Fasteners	
Effluent Flow Basis:			
Gallons/Ton of coated product	600	2,400	-
Gallons/Minute	-	-	100
Pollutants:			
Chromium, Hexavalent*	0.02(2)	0.02(2)	0.02(2)
Oil & Grease	10	10	10
Total Suspended Solids	30	30	30
122 Lead*	0.15	0.15	0.15
128 Zinc*	0.1	0.1	0.1
pH, Units	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0

---

*BPT only

(1) Concentrations are expressed as mg/l unless otherwise noted. Maximum daily concentrations are three times the 30-day average concentrations shown above, except for TSS, for which the limit is based upon 70 mg/1.

(2) Only applies to galvanizing operations which discharge wastewaters from a chromate rinsing step.

TABLE II-2

BPT AND BCT EFFLUENT LIMITATIONS
HOT COATING SUBCATEGORY

		BPT and BCT Limitations					
		Galvanizing, Terne & Other Metal Coating Subdivision				Fume Scrubber Subdivision(1)	
		Strip, Sheet & Misc. Prod.		Wire Products & Fasteners			
		Kg/kkg of Product		Kg/kkg of Product		Kg/Day	
	Pollutant	Daily Maximum	30-Day Average	Daily Maximum	30-Day Average	Daily Maximum	30-Day Average
	Chromium, Hexavalent*	0.000150(2)	0.0000501(2)	0.000601(2)	0.000200(2)	0.0327(2)	0.0109(2)
	Oil & Grease	0.0751	0.0250	0.300	0.100	16.3	5.45
	Total Suspended Solids	0.175	0.0751	0.701	0.300	38.1	16.3
122	Lead*	0.00113	0.000375	0.00451	0.00150	0.245	0.0817
128	Zinc*	0.000751	0.000250	0.00300	0.00100	0.163	0.0545
	pH, Units	6.0 to 9.0		6.0 to 9.0		6.0 to 9.0	

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*BPT only

(1) Limitations apply to each fume scrubber serving hot coating operations, and are added to other applicable limitations.
(2) Only applies to galvanizing operations which discharge wastewaters from a chromate rinsing step.

TABLE II-3

BAT, NSPS, PSES and PSNS TREATMENT MODEL FLOWS AND EFFLUENT QUALITY
HOT COATING SUBCATEGORY

		30-Day Average Concentration(1)				
		Galvanizing, Terne & Other Metal Coatings Subdivision				Fume Scrubber Subdivision
		Strip, Sheet & Miscellaneous		Wire Products & Fasteners		
		BAT PSES	NSPS PSNS	BAT PSES	NSPS PSNS	BAT, NSPS PSES & PSNS
	Effluent Flow Basis:					
	Gallons/Ton of coated product	600	150	2,400	600	-
	Gallons/Minute	-	-	-	-	15
	Pollutants:					
	Chromium, Hexavalent	0.02(2)	0.02(2)	0.02(2)	0.02(2)	0.02(2)
	Oil & Grease*	-	10	-	10	10
	Total Suspended Solids*	-	30	-	30	30
122	Lead	0.15	0.15	0.15	0.15	0.15
128	Zinc	0.1	0.1	0.1	0.1	0.1
	pH, Units*	-	6.0-9.0	-	6.0-9.0	6.0-9.0

---

*NSPS only

(1) Concentrations are expressed in mg/l unless otherwise noted. Maximum daily concentrations are three times the 30-day average concentrations shown above, except for TSS, for which the limitation and standard is based upon 70 mg/l.

(2) Only applies to galvanizing operations which discharge wastewaters from a chromate rinsing step.

TABLE II-4

EFFLUENT LIMITATIONS AND STANDARDS
HOT COATING SUBCATEGORY

		Limitations and Standards									
		Galvanizing, Terne and Other Metal Coatings Subdivision								Fume Scrubber Subdivision(1)	
		Strip, Sheet and Miscellaneous Products				Wire Products and Fasteners					
		Kg/kkg of Coated Product				Kg/kkg of Coated Product				Kg/Day	
		BAT PSES		NSPS PSES		BAT PSES		NSPS PSNS		BAT, NSPS PSES & PSNS	
	Pollutant	Daily Max.	30-Day Avg.	Daily Max.	30-Day Avg.	Daily Max.	30-Day Avg.	Daily Max.	30-Day Avg.	Daily Max.	30-Day Avg.
	Chromium, Hexavalent(2)	0.000150	0.0000501	0.0000375	0.0000125	0.000601	0.000200	0.000150	0.0000501	0.00490	0.00163
	Oil & Grease*	-	-	0.0188	0.00626	-	-	0.0751	0.0250	2.45	0.819
	Total Suspended Solids*	-	-	0.0438	0.0188	-	-	0.175	0.0751	5.72	2.45
122	Lead	0.00113	0.000375	0.000282	0.0000939	0.00451	0.00150	0.00113	0.000375	0.0368	0.0123
128	Zinc	0.000751	0.000250	0.000188	0.0000626	0.00300	0.00100	0.000751	0.000250	0.0245	0.00819
	pH, Units*	-		6.0 to 9.0		-		6.0 to 9.0		6.0 to 9.0	

---

* NSPS only

(1) Limitations and standards apply to each fume scrubber serving hot coating operations, and are added to other applicable loads.

(2) Only applies to galvanizing operations which discharge wastewaters from a chromate rinsing step.

HOT COATING SUBCATEGORY

SECTION III

INTRODUCTION

Background

The Hot Coating Subcategory has been modified to include galvanizing, terne coating, and hot coating with other metals. The prior regulation (41 FR 12990) limited only galvanizing and terne coating operations.

The originally promulgated limitations were primarily based upon data obtained through field sampling at six hot coating facilities. This study includes field sampling at two of the same plants and five additional hot coating operations. In addition, an overall review of flow and wastewater treatment components used at the hot coating plants surveyed by basic data collection portfolios (DCPs) was completed. Summaries of the responses to these DCPs are shown as Table III-1 for galvanizing operations, Table III-2 for terne coating operations, and Table III-3 for hot coating operations which apply aluminum, cadmium, lead, tin or combinations of these metals with zinc. These tables identify products, coatings, ages, sizes, operating modes, applied and discharged wastewater flows, control and treatment technologies, and ultimate discharge mode for each hot coating production line for which data have been received. Ninty-eight percent of the responses contained sufficiently detailed data for use in these summaries. The remaining lines were either inactive at the time of the request, or were being phased out.

DCP responses were solicited from about five-sixths of the domestic hot coating line operators which represents 97 percent of the nation's hot coating capacity. The Agency's data collection effort focused on acquiring data from the ten largest steel companies, from selected other companies known to have wastewater treatment systems in place, and, from a representatve group of the smaller operators. This approach has provided data on lines as small as 525 pounds per turn and as large as 940 tons per turn. The largest steel corporation in the country provided data for 28 hot coating lines varying in size from a 1.8 ton per turn wire coating line to a 321 ton per turn continuous strip and sheet galvanizing operation. The Agency is confident that the DCP responses are representative of all hot coating operations, including those plants not solicited for data. Following a review of the DCP responses, detailed data collection portfolios (D-DCPs) requesting information on existing wastewater treatment practices, and cost and effluent data were forwarded to nine operations, including one operation which was previously sampled. Overall, field sampling covered 14% of the plants with annual capacities totaling about 17% of the estimated domestic hot coating capacity. Detailed pollutant concentration and load data as well as cost data were sought from plants accounting for an additional 17% of the national production capacity, and basic data were requested for plants comprising 97% of national capacity. Table III-4 summarizes the data base for the entire hot coating subcategory.

The Agency obtained both in-process and end-of-pipe samples during the field sampling visits. Data for raw wastewater and effluent characteristics, water use and cost information supplied for individual plants from historical records were also obtained during such visits. NPDES permit application data were of limited value for the purposes of this study since most of these data are for outfalls serving more than one operation. However, NPDES self monitoring data for selected plants with well designed and operated treatment facilities were evaluated to characterize the performance of the model wastewater treatment systems.

The alternative treatment systems and effluent limitations were derived from available data for the actual performance of existing plants. Other plants were reviewed for demonstrated technologies which, together with field sampling data, provide the basis for various BAT, BCT, NSPS, PSES, and PSNS treatment systems.

Descriptions of Hot Coating Operations

Hot coating processes in the steel industry involve the immersion of clean steel into baths of molten metal for the purpose of depositing a thin layer of the metal onto the steel surface. These coatings provide desired qualities, such as resistance to corrosion, safety from contamination, or a decorative bright appearance. Finished products retain the strength of steel while gaining the improved surface quality of the coated metal for a fraction of the cost of products made entirely of that metal alone.

All methods for applying protective coatings to steel products require careful attention to proper surface preparation - the primary and most important step in the coating process. Without proper surface preparation, good adhesion is impossible. Surface preparation methods vary depending upon the type of coating applied and upon the shape of the surface being coated, but all methods aim at cleanliness and uniformity of the surface. The most common methods used are acid pickling to remove scale or rust, alkaline or solvent cleaning to remove oils and greases, and physical desurfacing with abrasives to eliminate surface imperfections.

The two major classes of metallic coating operations in the industry are hot coating and cold coating. Zinc, terne, and aluminum coatings are most often applied from molten metal baths, while tin and chromium are usually applied electrolytically from plating solutions. Cold Coating operations are being addressed separately as part of the Metal Finishing Industry.

Hot Coating

Hot-dipped coating using baths of molten metal is practiced in the steel industry as a batch-dip operation for sheet, plate, pipe or other pre-formed products, or on a continuous basis for coiled wire or strip and sheet. Operating processes vary, depending on the coating being applied. Refer to Figures III-1, III-2 and III-3 for typical process flow diagrams for galvanizing (zinc) coating operations, and to Figures III-4 and III-5, for terne coating and aluminizing process flow diagrams. While aluminum is shown as an example of other metal coating, similar processes are used for the cadmium, lead, hot-dipped tin, and mixtures of various metals. Other coating lines may also be batch dip or continuous operations.

Galvanizing

The batch-dip operation normally follows hot rolling, batch annealing, cold rolling, and pre-forming or sizing operations. Rolling lubricants are removed by alkaline cleaning, and final surface preparation is usually provided by mild acid pickling in stationary tubs with slight agitation. Following pickling, residual acid and iron salts are removed by an alkaline dip, water rinsing, or prolonged immersion in boiling water. The latter practice has the added advantage of minimizing hydrogen embrittlement. Clean base metal forms are then conveyed, manually or by moving belt, through the flux box section of the coating pot, and immersed in the molten metal. Coated products are withdrawn from the bath and dried by a warm air blast, or chemically treated with ammonium chloride, sulfur dioxide, chromate or phosphate solutions to provide special finishes and surface characteristics. The product may then be rinsed with water and prepared for shipment.

Continuous hot-dip galvanizing accounts for more than 60% of total galvanizing production. The simplest version starts with annealed and tempered steel which receives a mild muriatic acid (HCl) pickle and rinse, then proceeds directly through a layer of fluxing agent to the molten zinc bath. The coated product is dried and recoiled, or cut to size for shipment. More elaborate continuous galvanizing lines include additional stages preceding and following the hot-dip step. At least one strip galvanizer incorporates a sequence of pickling in hot sulfuric acid; rinsing and scrubbing with brushes; a dip into a hot alkaline cleaning solution; scrubbing in alkaline solutions; an electrolytic hot alkaline cleaning step, rinsing and scrubbing with brushes; a light pickle in hot sulfuric acid; rinsing and scrubbing with brushes; a dip into a hot zinc sulfate flux bath; a hot dip into molten zinc; dip and spray with chromate or phosphate solutions; a final water rinse; drying with hot air; and recoiling.

Other producers use a so-called "furnace line" to anneal the steel product prior to coating with zinc. Without annealing, incoming coils to hot coating operations are very hard following cold reduction. Furnace line operators include annealing as follows: cold rolled coils are given a hot alkaline cleaning, rinsing, and scrubbing; and pickling in hot acid followed by water rinses. The strip is then placed in a controlled atmosphere heating chamber (annealing furnace) up to 60 meters (200 ft.) in length with a series of independently controlled heat zones to provide temperatures required for annealing, yet sufficient cooling so that strip exits the furnace at temperatures slightly above the molten bath temperature. A mixture of NX gas (principally nitrogen, with controlled amounts of methane, carbon monoxide, and carbon dioxide) and cracked ammonia is used in some annealing furnaces to prevent oxidation and decarburization. The strip is discharged from the exit end of the furnace below the surface of the molten zinc bath. A sinker roll submerged near the surface of the zinc bath is used for controlling the thickness and distribution of the coating. Forced air blasts are used to cool the exiting strip and to help solidify the zinc coating. Chromate or phosphate chemical treatments may be provided at this point to retard formation of white corrosion products on the coating. A final rinse and drying step may also follow. Finished coated strip is recoiled or cut to size ready for shipment.

Another type of furnace line subjects cold rolled strip to a complex furnace gas containing hydrogen chloride. After annealing and cooling, a mild hydrochloric acid pickling is completed just prior to the flux section of a conventional molten zinc pot. In place of the usual exit rolls for controlling coating thickness, flexible wipes are used to yield very thin, but extremely adherent zinc coatings.

Terne Metal

Terne is an inexpensive, corrosion-resistant hot-dipped coating consisting of lead and tin in a ratio typically in the range of five or six to one. Lead alone does not alloy with iron, but does form a cohesive solution with tin, which in turn alloys readily with iron, although requiring higher temperatures than for tin alone. Most of the terne coated material is used in the automobile industry to manufacture gasoline tanks, with lesser amounts going into the production of automotive mufflers, oil pans, air cleaners, and radiator parts. Other end products made of terne metal include roofing materials, portable fire extinguishers, and burial caskets.

As in the case of hot-dipped galvanizing processes, both batch and continuous terne coating processes are used, although the continuous process is used to supply by far the larger portion of the market. Both metals used in terne coating are corrosion-resistant, as is their combination. But since both lead and tin are cathodic to iron in most environments, corrosion is actually accelerated if any portion of the base metal is exposed. For this reason, terne coatings are usually thicker than other metallic coatings. For maximum corrosion resistance, even the thickest terne coatings benefit from painting or other protective finishing.

The batch-dip terne coating operation normally is performed on cold reduced, batch annealed, and temper rolled coils cut into sheets. Oils and greases are removed by alkaline or solvent (mineral spirits) cleaning, and final surface preparation requires a hydrochloric acid dip just prior to coating. Excess acid is squeezed from the sheets by rubber rolls. The sheets are then conveyed through a flux box containing a hot solution of zinc chloride in hydrochloric acid, or a molten zinc chloride salt bath to remove residual iron oxides and to provide dry steel surface. The sheets are then passed downward through a molten terne metal bath maintained at 325°C to 360°C (617°F to 680°F), where the coating is applied, then upward through an oil bath floating atop the terne pot. This oil tends to maintain the high temperature long enough for oil rolls to control deposition and coating thickness evenly over the sheet surfaces. Although most batch-dipped terne coatings use a single unit as described above, the wider range of coating weights sometimes requires a pass through a second molten metal bath of the same type, but including another oil bath instead of the zinc chloride flux box prior to the application of the second coat.

The steel strip fed to a continuous terne coating operation receives the same preliminary treatment as the steel processed on the batch-dip line, except that it remains in the coil form, and the cleaning procedure prior to pickling is most often done electrolytically. The normal sequence is oil and grease removal in an electrolytic alkaline unit; rinsing and scrubbing with brushes; pickling; terne coating; and, oiling by a process similar to batch dipping. After cooling, residual oils are removed in a "branner", which consists of tandem sets of cleaning rolls made of thousands of tightly compressed flannel discs. Middlings from grain milling, called bran, are fed to the first set of rolls to absorb moisture and excess oil, while the remaining rolls distribute a light oil film evenly over the entire coated surface. The final product is then recoiled, or cut to size for shipment as terne coated flats. Additional detail for a terne line is illustrated in Figure III-4.

Aluminum

Another metallic coating applied using the hot-dip technique is aluminum. Products made of aluminum coated steel include bright and matte finished sheets and strip used as building materials in marine, industrial, or other environments where a high degree of resistance to corrosion is required. Aluminum coated wire is used for chain-link and field fencing, barbed wire, telephone wire, and screening.

The batch coating process uses either a conventional molten metal bath, as in zinc or terne coating, or a special cementation process called calorizing. Thoroughly cleaned, degreased, and dried steel products are packed in a rotating drum, along with a mixture of aluminum powder, aluminum oxide, and ammonium chloride. As the drum rotates inside a furnace at 940°C-955°C (1,724°F-1,751°F) a reducing gas is passed into the drum, and the mixture is tumbled for 4-5 hours. A cohesive solution of aluminum in iron, richest in aluminum near the surface, forms the coating. This type of coating is especially effective in protecting steel from oxidation at high temperatures, hence it is used in pyrometer and superheater tubes, and in a variety of oil refinery applications.

The continuous aluminum coating process starts with cold rolled steel strip or steel wire. The strip lines are usually furnace lines, with an annealing step just prior to the hot-dip in molten aluminum. The sequence is much the same as zinc coating on a furnace line. The cold rolled steel coils are cleaned in a hot alkaline solution, rinsed, and given a mild pickling in hot acid, followed by a final rinse. An annealing furnace softens the otherwise hard carbon steel, and the coating is applied immediately following the furnace. The strip exiting the aluminum bath is cooled, oiled if required, and recoiled or cut to size for shipment. There is usually no chemical treatment or final rinse following the aluminizing dip.

In making aluminum-coated wire products by the hot-dipped process, clean, cold-drawn carbon-steel wire is passed through the molten aluminum bath at 660°C-680°C (1,220°F, 256°F). This temperature is high enough to soften the carbon-steel wire sufficiently that annealing is not required, but the tensile strength of the wire is reduced, rendering it unsuited for certain applications. This problem is readily corrected by cold-drawing the coated wire, which not only raises the tensile strength, but also provides a very bright final finish to the coating.

Additional detail for an aluminizing line is illustrated in Figure III-5.

Other Hot-Dipped Metal Coatings

Other hot coating operations involve combinations of zinc and aluminum, zinc and cadmium, or zinc, tin and cadmium. There are also some wire coating operations which use molten tin, or cadmium alone as the coating agent. However, the latter processes comprise a minor fraction of hot-dipped coating operations. Most tin plating production at steel plants is electrolytic, as is all chromium plating and a limited amount of zinc coating.

TABLE III-1

HOT COATING SUBCATEGORY - GALVANIZING SUMMARY

Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow		Discharge Flow		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse GPT	Scrubbers GPM	Rinse GPT	Scrubbers GPM	Process	Central		
0060-01	Strip	1946	111	<1	C	NR	-	NR	-	-	(NL),AE,(FLP),SS, (CL),(VF)	OT	D
0060-02	Strip	1960	326	2	C	NR	-	NR	-	-		RUX	D
0060B-01	Strip	1955	126	<1	C	E675	-	E675	-	-	CR,NL,AE,FLP, CL,CT,VF	ReTx	D
0060B-02	Strip	1967	265	3	C		-		-	-		ReTx	D
0060G-01	Wire	~1940	*	*	C	*	66	*	6	RFH91 N(acid)	E,AE, NL,TP	RU61;RT25	D
0060G-02	Wire	1965	*	*	C	*	66	*	6			RU61;RT25	D
0060G-03	Wire	1965	*	*	C	*	66	*	6			RU61;RT25	D
0060G-04	Wire	1967	*	*	C	*	165	*	15			RU76;RT10	D
0060G-05	Wire	1968	*	*	C	*	79	*	7		E,NC,NA, NL	RU65;RT21	D
0060G-06	Fast.	1966	*	*	B	*	NR	*	NR	-		RT85	P
0060G-07	Fast.	1969	*	*	B	*	NR	*	NR	-		RT85	P
0060R	Sheet,Plate	1975	61.2	1	B	942	-	314	-	NW,RR	-	RU67	P
0060S-01	Wire	~1950	*	*	C	*	200	*	20	RFH90,RR N(acid)	NL,AE	RU88	P
0060S-02	Wire	~1950	*	*	C	*		*				RU88	P
0060S-03	Wire	1970	*	*	C	*	79	*	7			RU78	P
0068-01	Strip,Bar	1934	13.1	<1	B	916	-	916	-	-	-	OT	P
0068-02	Fence	1934	34.6	<1	C	693	-	693	-	-	-	OT	P
0068-03	Wire	1947	29.6	3	C	1103	-	1103	-	-	-	ReU100$^{(1)}$	P
0068-04	Nails	1920	3.3	3	BC	1425	-	1425	-	-	-	OT	P
0112A-01	Nails	1926	29 max.	<1	B	NR	-	NR	-		Scr,AE,NL,SS, FLA,FLP,T,CY	OT	D
0112A-02	Pipe	1929	79	2	B	NR	-	NR	-			OT	D
0112A-03	Sheet	1952	E150	2	C	E490	-	E464	-	-		ReU95$^{(2)}$	D
0112A-04	Sheet	1955	E250	2	C	E313	-	301	-			ReU96$^{(2)}$	D
0112A-05	Wire	1926	I	I	C	I	-	I	-			I	D
0112A-06	Wire	1926	13	2	C	NR	70	NR	70			OT	D
0112B	Strip	1962	359	3	C	409	230	409	230	-	NL,AE,CL,SS,FDSP FLP, VF	OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
PAGE 2

Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow		Discharge Flow		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse GPT	Scrubbers GPM	Rinse GPT	Scrubbers GPM	Process	Central		
0112F-01	Wire	1955	6.7	1	C	880	60	747	8	RFH87,RR	NO$^{(3)}$	RU71	P
0112F-02	Wire	1965	3.6	<1	C	817		694				RU83	P
0112G	Fasteners	~1930	4	<1	B	NR	7.5	NR	7.5	-	NC	OT	P
0112H	Wire	1971	1.14	2	C	895	-	895	-	-	NL,FLP,Cl,SL	OT	D
0112I-01	Fasteners	1922	21.6	1	B	NR	-	NR	-	-	NW,NL,AE,SS, FLP,T,FDSP,SL	ReTx	D
0112I-02	Washer,Rod	1970	7.5	<1	B	NR	-	NR	-	-		ReTx	D
0196A-01	Wire	1908	*	*	C	*	*	*	*	NL,CL	SS,SL	OT	D
0196A-02	Wire	1908	*	*	C	*	*	*	*			OT	D
0196A-03	Wire	1916	*	*	C	*	*	*	*			OT	D
0196A-04	Wire	1955	*	*	C	*	*	*	*			OT	D
0196A-05	Wire	1959	*	*	C	*	*	*	*			OT	D
0256D-01	Strip	1955	114	2	C	568	121	568	50	RFH59	NL,FLL,FLP, CL,VF,SS	RU28	D
0256D-02	Strip	1965	228	2	C	274	171	274	70	RFH59		RU34	D
0256G-01	Pipe	~1940	78.5	2	B	107	Dry	107	Dry	-	(NL)	OT	D
0256G-02	Pipe	~1940	78.5	2	B	107	Dry	107	Dry	-		OT	D
0264-01	Wire	1959	12.2	3	C	1580	10	596	10	RR	NO$^{(3)}$,CL,SS	RU50	P
0264-02	Wire	1963	11.9	3	C	1210	10	605	10	RR		RU38	P
0264-03	Fence	1961	18.1	3	C	451	Dry	4.5	Dry	RR		RU99	P
0264A-01	Rod	1965	8.2	3	B	1754	10	877	10	RR	NO$^{(3)}$,CL,SS	RU37	P
0264A-02	Rod	1965	10.5	3	B	1371	10	686	10	RR		RU37	P
0264D-01	Wire	1966	18.6	3	C	3226	Dry	1032	Dry	RR	NO$^{(3)}$,CL,SS	RU68	P
0264D-02	Wire	1972	20.9	3	C	2641	15	574	15	RR		RU69	P
0384A-01	Strip	1951	106	2	C	31.6	-	31.6	-	-	PSP,SS,NL FLP,SS,CL	OT	D
0384A-02	Strip	1954	153	2	C	21.9	-	21.9	-	-		OT	D
0384A-03	Strip	1955	200	3	C	16.8	-	16.8	-	-		OT	D
0384A-04	Strip	1968	286	3	C	168	Dry	168	Dry	-		OT	D
0432A	Pipe	1930	59	3	C	NR	100	NR	100	-	FLL,FLP,FLA,CL, SSc,(NL),(NC),FLP, (SS),CL,T,VF	OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
PAGE 3

Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow		Discharge Flow		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse GPT	Scrubbers GPM	Rinse GPT	Scrubbers GPM	Process	Central		
0432B	Strip	1956	I	I	C	I	-	I	-	-	-	I	P
0432D	Sheet/Strip	1968	346	3	C	289	-	289	-	-	FLL,FLM,T,FDSP	OT	D
0448A	Sheet	1967	212	3	C	0.95	-	0.95	-	-	NO$^{(3)}$	OT	P
0460A-01	Wire	1932	4.0	3	C	4560	-	4200	-	-	PSP,AE,NL,FLP,CL, SL,SS	RU8	D
0460A-02	Wire	1944	9.7	3	C	2227	-	1979	-	-		RU11	D
0460A-03	Wire	1932	21.6	3	C	1000	14	889	14	-		RU8	D
0460A-04	Wire	1930	21.6	3	C	1222	-	1111	-	-		RU9	D
0460A-05	Wire	1934	18.2	3	C	1451	-	1319	-	-		RU9	D
0460A-06	Wire	1934	18.2	3	C	1187	-	1055	-	-		RU11	D
0460A-07	Wire	1934	29.9	3	C	722	-	642	-	-		RU11	D
0460A-08	Wire	1947	13.3	3	C	1913	-	1805	-	-		RU6	D
0460A-09	Wire	1949	8.3	3	C	1908	-	1735	-	-		RU9	D
0460A-10	Wire	1950	3.3	3	C	2327	-	2182	-	-		RU6	D
0460A-11	Wire	1974	11.7	3	C	2872	14	2667	14	-		RU6	D
0460C	Wire	1967	18.6	3	C	1080	30	5.4	0	RFH100,RR	-	RU99+	P
0460D-01	Wire	✓1927	15.1	3	C	993	-	NR	-	-	NL,FLP,CL,T,VF SS,(FDSP)	RTx	D
0460D-02	Wire	✓1927	15.1	3	C	993	-	NR	-	-		RTx	D
0460E-01	Wire Cloth	1970	1.8	3	C	1311	-	1311	-	-	(FLP),(NL),(CL), (FDSP),SS	OT	D
0460E-02	Wire	1947	16.5	3	C	873	-	873	-	-		OT	D
0460F-01	Wire Cloth	1965	0.34	3	C	706	-	141	-	RR	NL,CT	RT80	P
0460F-02	Wire	1965	3.1	3	C	627	-	125	-	RR		RT80	P
0460G	Wire	1968	10	3	C	1344	-	1344	-	-	NO$^{(3)}$,SL	OT	P
0460H-01	Wire	1925	1.8	2	B	507	-	507	-	-	-	OT	P
0460H-02	Wire	1925	1.8	2	B	507	-	507	-	-	-	OT	P
0476A-01	Wire	✓1930	3.6	2	C	2950	24	2950	24	-	SCR,SS,NL,AE, FLP,CL,VF	OT	D
0476A-02	Wire	✓1930	5.6	3	C	1886		1886		-		OT	D
0476A-03	Pipe	1930	60	1	B	56	Dry	56	Dry	-		OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
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Plant Code No.	Product	1st Year of Prod.	Production Rate Tons/Turn	Production Rate Turns/Day	Oper. Mode	Applied Flow Rinse GPT	Applied Flow Scrubbers GPM	Discharge Flow Rinse GPT	Discharge Flow Scrubbers GPM	Treatment Components Process	Treatment Components Central	Trt. Mode	Discharge Mode
0492A	Pipe	1962	62	1	C	1355	50	1355	0	PSP; RFH100	SS,SL	ReT100$^{(2)}$	Z
0580A-01	Wire Cloth	1962	1.3	3	C	4615	-	923	-	-	NW,NL,FDSP	ReT80	D
0580A-02	Wire Cloth	1962	1.3	3	C	4615	-	923	-	-		ReT80	D
0580G-01	Wire	~1960	0.38	<1	C	5600	-	5600	-	-	-	OT	P
0580G-02	Wire	~1960	0.75	<1	C	2800	-	2800	-	-	-	OT	P
0584C-01	Strip	1956	91	1	C	1688	250	1688	30	RFH88	SL,SS,CLB,CR,FDSP NL	RU39	D
0584C-02	Strip	1962	214	2	C	710	30	710	30	-		OT	D
0584C-03	Strip	1964	161	3	C	1043	-	1043	-	-		OT	D
0584E-01	Sheet	1960	135	2	C	NR	NR	NR	NR	-	SL,NW,NL,BOA2,CO, KB,FDSP,IX,CL, SS,DW(Acid),VF	OT	D
0584E-02	Sheet	1970	291	3	C	NR	NR	NR	NR	-		OT	D
0584F-01	Strip	1957	207	3	C	1391	-	1391	-	-	SL,SS,(NL)	OT	D
0584F-02	Strip	1958	79	1	C	3646	-	3646	-	-		OT	D
0584F-03	Strip	1966	187	3	C	1540	-	1540	-	-		OT	D
0612-01	Wire	~1950	22.3	3	C	1510	-	1510	-	FDSP	NL,FLP,SS, CL,VF	ReT100$^{(2)}$	D
0612-02	Wire	~1950	22.3	3	C	1510	-	1510	-			ReT100$^{(2)}$	D
0612-03	Wire	~1950	22.3	3	C	1510	-	1510	-			ReT100$^{(2)}$	D
0612-04	Wire	~1950	22.3	3	C	1510	-	1510	-			ReT100$^{(2)}$	D
0612-05	Fence	~1950	5.4	2	C	0(dry)	-	0(dry)	-	-(dry operation)		-	Z
0640-01	Fence	1936	17	3	C	529	-	529	-	NC	- NL,CL,VF,SL,SS	OT	D
0640-02	Wire	1936	34	3	C	3950	-	3950	-	-		ReU71	D
0640-03	Wire	1966	9.2	3	C	6522	-	6522	-	-		ReU71	D
0640B-01	Wire	~1950	5	3	C	4800	-	4800	-	-	FLP,NC,CL,SS	OT	P
0684A	Pipe	1940	71	1	C	608	Dry	608	Dry	H(acid)	-	OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
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Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow		Discharge Flow		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse GPT	Scrubbers GPM	Rinse GPT	Scrubbers GPM	Process	Central		
0684B-01	Strip	1955	I	I	C	I	I	I	I	H(acid)	SL,SS,NL	I	D
0684B-02	Strip	1962	154	3	C	2026	100	2026	100			ReU13	D
0684I	Strip	1958	171	2	C	1951	Dry	1951	Dry	-	NW,BOA1,SL,SS	OT	D
0684Y	Rod,Plate, Struct.	1934	*	*	B	*	-	*	-	-	E,NL,CL,FLP,FDSP	OT	D
0724A	Sheet	1952	106	3	C	0(dry)	-	0(dry)	-	-(dry operation)	-	-	Z
0728	Pipe	1952	25	1	B	480	Dry	0	Dry	H(acid)	SL,PSP,SS,CT	RT100	Z
0856D-01	Sheet	1947	144	1	C	333	-	333	-	-	(NL),(FLP),(T), (SS),(VF)	OT	D
0856F-01	Sheet	1968	266	2	C	586	105 (2 Units)	586	105 (2 Units)	-	CR,NW,NL,FLP,CL,SS	OT	D
0856F-02	Pipe	1953	74	<1	B	2270	1200	2270	0	PSP,SS, RFH100	GF,FLP,SL,BOA1,SS	RU77	D
0856H-01	Pipe	1947	150	<1	C	112	-	0	-	FDSP	-	RT100	Z
0856H-02	Pipe	1941	78	<1	C	214	-	0	-			RT100	Z
0856H-03	Pipe	1908	77	<1	B	218	-	0	-			RT100	Z
0856P	Wire	1917	5.6	1	C	15,540	170	15,540	0	H(acid) RFH100	-	ReU48	D
0856S-01	Wire	1927	6.3	3	C	0(dry)	-	0(dry)	-	-(dry operation)	-	-	Z
0856S-02	Wire	1937	1.8	2	C	0(dry)	-	0(dry)	-	-(dry operation)	-	-	Z
0860D-01	Sheet/Strip	1950	321	1	C	935	-	935	-	-	NL,FLP,SL	OT	D
0860D-02	Sheet/Strip	1957	160	1	C	1385	-	1385	-	-		OT	D
0860D-03	Sheet/Strip	1962	109	2	C	1835	-	1835	-	-		OT	D
0860F-01(4)	Wire	1942	23	2	C	3130	-	157	-	DW(acid)	NL,NA,PSP,T, VF,FDSP,CT DW(acid),RR	RU95,RT4.5	D
0860F-02(4)	Wire	1942	12.5	1	C	5760	-	9.6	-			RU97,RT2.6	D
0860F-03(4)	Wire	1942	12.5	1	C	5760	-	6.4	-			RU95,RT4.5	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
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Plant Code No.	Product	1st Year of Prod.	Production Rate Tons/Turn	Production Rate Turns/Day	Oper. Mode	Applied Flow Rinse GPT	Applied Flow Scrubbers GPM	Discharge Flow Rinse GPT	Discharge Flow Scrubbers GPM	Treatment Components Process	Treatment Components Control	Trt. Mode	Discharge Mode
0860G-01(4)	Wire	1942	8.8	2	C	8182	-	0	-	PSP	-	RT100	Z
0860G-02(4)	Wire	1940	23.8	2	C	3025	-	0	-		-	RT100	Z
0860G-03	Wire	1944	4.6	I	C	I	-	I	-	-	-	I	-
0864B-01	Wire	1937	19.7	2	C	4386	-	4386	-	-	NL,NA,FLL, FLP,CL,SK,SS RFH100	OT	D
0864B-02	Wire	1943	9.4	2	C	6128	-	6128	-	-		OT	D
0864B-03	Nails	1943	7.1	2	B	6761	30	6761	0	-		RU23	D
0864B-04	Sheet	1951	121	3	C	2182	-	2182	-	-		ReU50(2)	D
0864B-05	Sheet	1963	288	2	C	325	5	325	0	-		OT	D
0864B-06	Pipe	1966	132	<1	B	727	40	727	0	-		RU17	D
0868A-01	Sheet	1948	87	3	C	182	-	182	-	-	CL,FDSP;CL;SS,SL FLP,FLS;NL;	ReT88(2)	D
0868A-02	Sheet	1952	117	3	C	135	-	135	-	-		ReT88(2)	D
0868A-03	Sheet	1968	313	3	C	169	10	169	10	-		ReT88(2)	D
0868A-04	Wire	1914	12	3	C	960	-	960	-	DW(acid)	NL,CL	OT	D
0868A-05	Nails	1914	7	2	B	2326	-	2326	-	PSP		OT	D
0916A-01	Pipe	1937	200	1	B	0(dry)	Dry	0(dry)	Dry	-(dry operation)	-	-	Z
0916A-02	Pipe	1974	142	1	B	0(dry)	Dry	0(dry)	Dry	-(dry operation)	-	-	Z
0916A-03	Couplings	1942	4	<1	B	120	-	0	-	SS	-	RU100	Z
0920D-01	Pipe	1950	75	2	B	768	90	64	0	PSP,SSP RFH100, RR(1 Unit)	-	RT45,RU50	D
0920D-02	Pipe	1972	40	1	B	120	135	120	0		-	RU93	D
0920E-01	Sheet/Strip	1966	331	2	C	116	200	116	200	NL,FLP, T,VF,SS	-	OT	D
0920E-02	Sheet/Strip	1955	212	2	C	136	190	136	190		-	OT	D
0920E-03	Sheet/Strip	1953	146	2	C	164	120	164	120		-	OT	D
0936	Wire	1969	5.8	1	C	2483	Dry	1655	Dry	-	AE,NC	RU33	P
0948A	Pipe	1922	I	I	B	I	Dry	I	Dry	-	AO,FLL,FLP,TP,VF	OT	D
0948C-01	Strip	1961	171	2	C	140	-	140	-	-	FLL,FLP,T,SS	OT	D
0948C-02	Strip	1964	261	3	C	92	-	92	-	-		OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
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Key to Abbreviations and Symbols

GPT: Gallons per ton of coated product
GPM: Gallons per minute
C : Continuous coating operation
B : Batch coating operation
~ : Approximately
NR : Data not reported by plant
* : Company has requested confidential treatment of this data
D : Direct discharge
P : POTW
Z : Zero
OT : Once-through

RU : Recycled to coating operation untreated
RT : Recycled to coating operation after treatment
ReU: Untreated wastewater reused elsewhere
ReT: Treated wastewater reused elsewhere
I : Line is now inactive
( ): Indicates component installed since 7/1/78.
- : None
x : Percent unknown
For RU,RT,ReU, and ReT, number following symbol indicates percent of flow recycled or reused.

Footnotes

(1) Reused at H_2SO_4 pickler
(2) Reused as mill service water
(3) Neutralization using ammonia
(4) Shutdown since 1/1/79.

NOTE: For abbreviations used under "Treatment Components," see Table VII-1.

TABLE III-2

HOT COATING SUBCATEGORY - TERNE COATING SUMMARY

Plant Code No.	Product	1st Year of Prod.	Production Rate Tons/ Turn	Production Rate Turns/ Day	Oper. Mode	Applied Flow Rinse GPT	Applied Flow Scrubbers GPM	Discharge Flow Rinse GPT	Discharge Flow Scrubbers GPM	Treatment Components Process	Treatment Components Central	Trt. Mode	Discharge Mode
0060-03	Strip	1949	71	2	C	[670]	-	[670]	-	-	(NL),(FLP),SS,	OT	D
0060-04	Strip/Sheet	1962	103	3	C	[460]	[25]	[460]	[25]	-	(CL),(VF),(AE)	OT	D
0648	Strip	1968	4.5	<1	C	533	Dry	533	Dry	None	None	OT	P
0684B-03	Strip	1957	75	3	C	640	200	640	200	H(acid), (NL)	SL,SS	OT	D
0856D-02	Strip/Sheet	1964	187	3	C	2567	50	2567	50	-	(SS),(NL),(FLP), (T),(VF)	OT	D
0920F	Sheet	1962	51	3	SC	301	-	160H 141D	-	H(acid),SS SS	None	H53%, BD47%	D

GPT: Gallons per ton of terne coated product
GPM: Gallons per minute
E : Estimated flow from plant DCP response
C : Continuous
SC : Semi-continuous
H : Hauled off-site by contractor
D : Discharged directly to receiving stream
OT : Once-through
BD : Blowdown from treatment (discharged)
P : Discharged indirectly via a publicly owned treatment works (municipal sewage treatment plant)
[ ]: Data obtained during field sampling survey.
( ): Indicates component installed since 7/1/79.

NOTE: For abbreviations under "Treatment Components," see Table VII-1.

TABLE III-3

HOT COATING SUBCATEGORY - OTHER METAL COATING SUMMARY

Plant Code No.	Product	Coat-ing	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow		Discharge Flow		Treatment Components		Trt. Mode	Discharge Mode
				Tons/ Turn	Turns/ Day		Rinse GPT	Scrubbers GPM	Rinse GPT	Scrubbers GPM	Process	Central		
0112A-07	Sheet	Al/Zn	1972(1)	125	<1	C	461	-	457	-	-	SS,NL,AE,FLP,SL,	ReU99+(2)	D
0112C	Wire	Al	1960	8.8	2	C	NR	-	NR	-	ES(acid)	AE,NL,CL,T,SS	OT	D
0112I-03	Fasten-ers	Al	1955	1.2	<1	B	NR	-	NR	-	-	NW,NL,T,FDSP, SS,SL,FLP	OT	D
0384A-5	Strip	Al	1961	208	3	C	16	Dry	16	Dry	-	PSP,SS	OT	D
0460H-03	Wire	Sn	1925	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-04	Wire	Sn	1925	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-05	Wire	Sn	1925	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-06	Wire	Sn	1925	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-07	Wire	Sn	1964	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-08	Wire	Sn	1973	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-09	Wire	Sn	1973	0.7	2	B	1270	-	1270	-	-	-	OT	P
0580G-03	Wire	Sn	~1960	0.3	3	C	800	-	800	-	-	-	OT	P
0580G-04	Wire	Sn	~1960	1.0	1	C	300	-	300	-	-	-	OT	P
0580G-05	Wire	Cd	~1960	0.3	<1	C	2424	-	2424	-	-	-	OT	P
0580G-06	Wire	Cd/Sn/ Zn	~1960	0.8	3	C	5250	-	5250	-	-	-	OT	P
0640B-02	Wire	Sn	~1950	1.0	2	C	7200	-	7200	-	-	FLP,NC,CL,SS	OT	P
0792A	Wire	Cd/Zn	1934	0.3	<1	C	1832	-	1832	-	-	-	OT	P
0792B	Strip	Sn	1950	0.6	2	C	80	Dry	0	Dry	-	CT	RT100	Z
0856D-03	Sheet	Al/Zn	1949	172	2	C	558	-	558	-	-	(FLP),(NL), (SS),(T),(VF)	OT	D
0860F-04	Wire(3)	Al	1962	15	2	C	10,800	360 (3 Units)	640	0		NL,SSP,T,VF,FDSP, CT,DW(ACID),RFH, RR	RU97	D

TABLE III-3
HOT COATING SUBCATEGORY - OTHER METAL COATING SUMMARY
PAGE 2

Key to Abbreviations and Symbols

GPT: Gallons per ton of coated product
GPM: Gallons per minute
C : Continuous coating operation
B : Batch coating operation
~ : Approximately
NR : Data not reported by plant
OT : Once-through
ReU: Reused untreated
RU : Recycled to coating line untreated
RT : Recycled to coating line treated
D : Discharge directly
I : Plant is inactive
P : Discharged via POTW
Z : No discharge
– : None
Al : Aluminum
Sn : Tin
Cd : Cadmium
Zn : Zinc

Footnotes

(1) Converted from galvanizing to Al/Zn in 1972; line actually built in 1956.
(2) Reused as mill service water.
(3) Shutdown since 1/1/79.

NOTE: For abbreviations under "Treatment Components," see Table VII-1.

TABLE III-4

HOT COATING DATA BASE

	No. of Plants	% of Total No. of Plants	Annual Capacity of Plants In Data Base	% of Total Estimated Annual Capacity
Plants sampled for Original study	6	7.5	1,128,920	12.9
Plants sampled for toxic pollutant study	7 (incl. 2 above)	8.8 (incl. 2.5 above)	1,067,300 (incl. 683,200 above)	12.2 (incl. 7.8 above)
Total plants sampled	11	13.8	1,513,020	17.3
Plants surveyed via detailed DCP	9 (incl. 1 above)	11.3(incl. 1.3 above)	1,989,260 (incl. 537,420 above)	22.7 (incl. 6.1 above)
Plants sampled and/ or solicited via detailed DCP	19	23.8	2,964,860	33.9
Plants responding to basic DCP	66 sites*	82.5	8,469,560	96.9
Total for all Hot Coating Plants	80 sites	100.0	8,742,500	100.0

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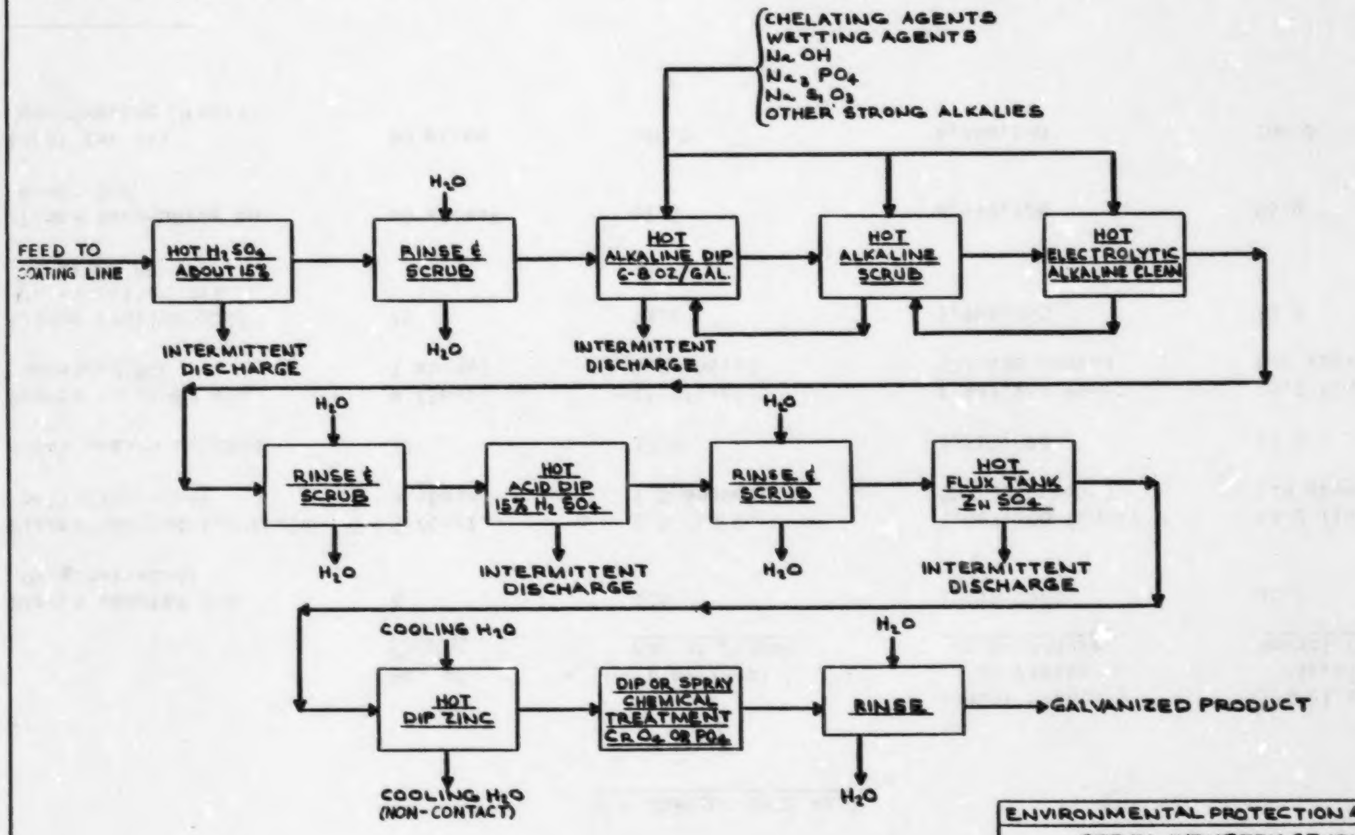
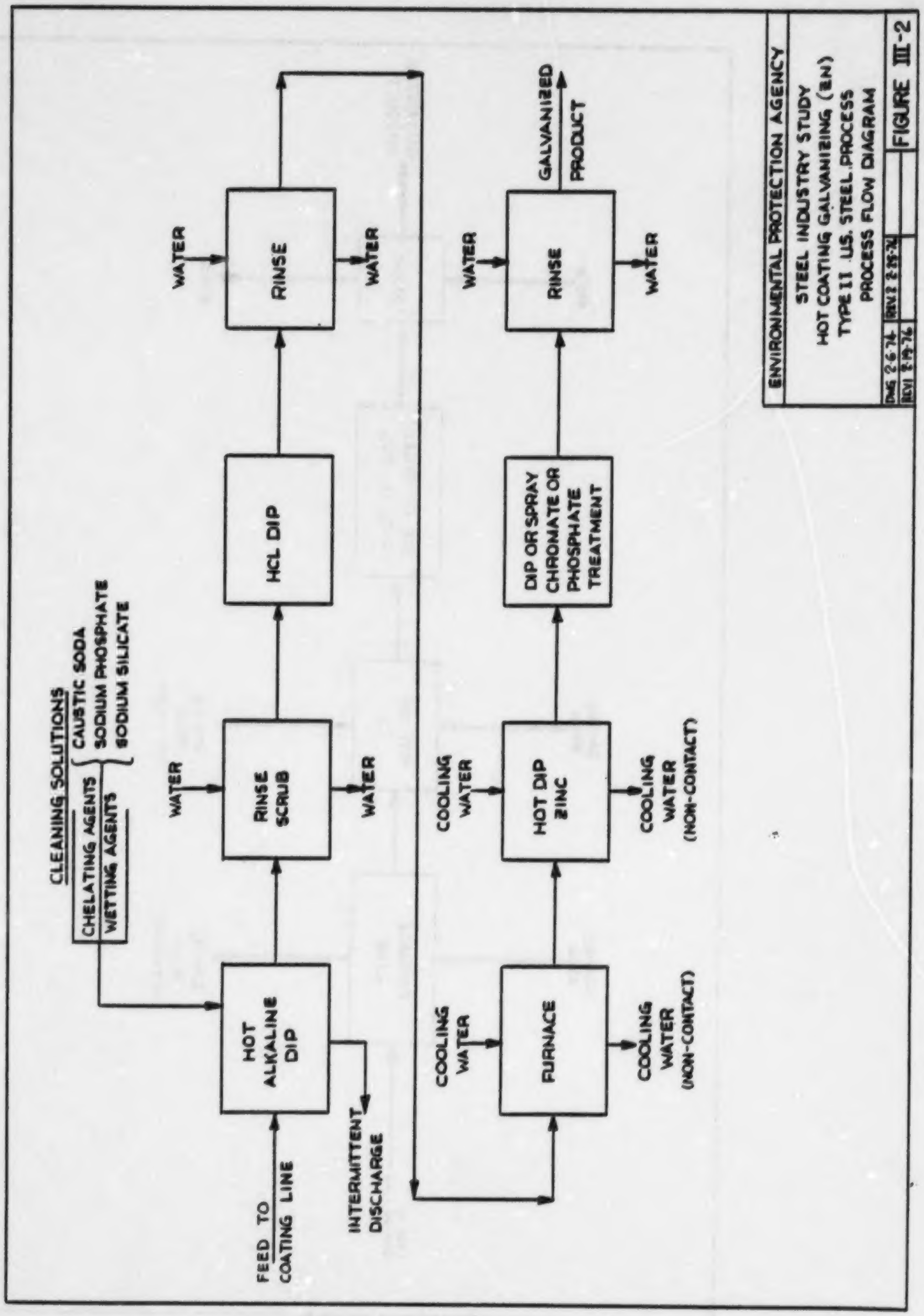
* Representing 174 production lines. At least 12 lines, representing five sites have been closed down permanently since basic DCP responses were tabulated. These closings represent a reduction of 400,000 tons per year in annual capacity.


FEED TO COATING LINE
HOT H_2SO_4 ABOUT 15%
INTERMITTENT DISCHARGE
H_2O
RINSE & SCRUB
H_2O
CHELATING AGENTS
WETTING AGENTS
$NaOH$
Na_3PO_4
$Na_2S_2O_3$
OTHER STRONG ALKALIES
HOT ALKALINE DIP 6-8 OZ/GAL.
INTERMITTENT DISCHARGE
HOT ALKALINE SCRUB
HOT ELECTROLYTIC ALKALINE CLEAN
H_2O
RINSE & SCRUB
H_2O
HOT ACID DIP 15% H_2SO_4
INTERMITTENT DISCHARGE
H_2O
RINSE & SCRUB
H_2O
HOT FLUX TANK $ZnSO_4$
INTERMITTENT DISCHARGE
COOLING H_2O
HOT DIP ZINC
COOLING H_2O (NON-CONTACT)
DIP OR SPRAY CHEMICAL TREATMENT CrO_4 OR PO_4
H_2O
RINSE
H_2O
GALVANIZED PRODUCT

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATING GALVANIZING (ZN)
TYPE I
PROCESS FLOW DIAGRAM

DWG. 2-6-74	REV.2 2-25-76	FIGURE III-1
REV.1 2-19-76		

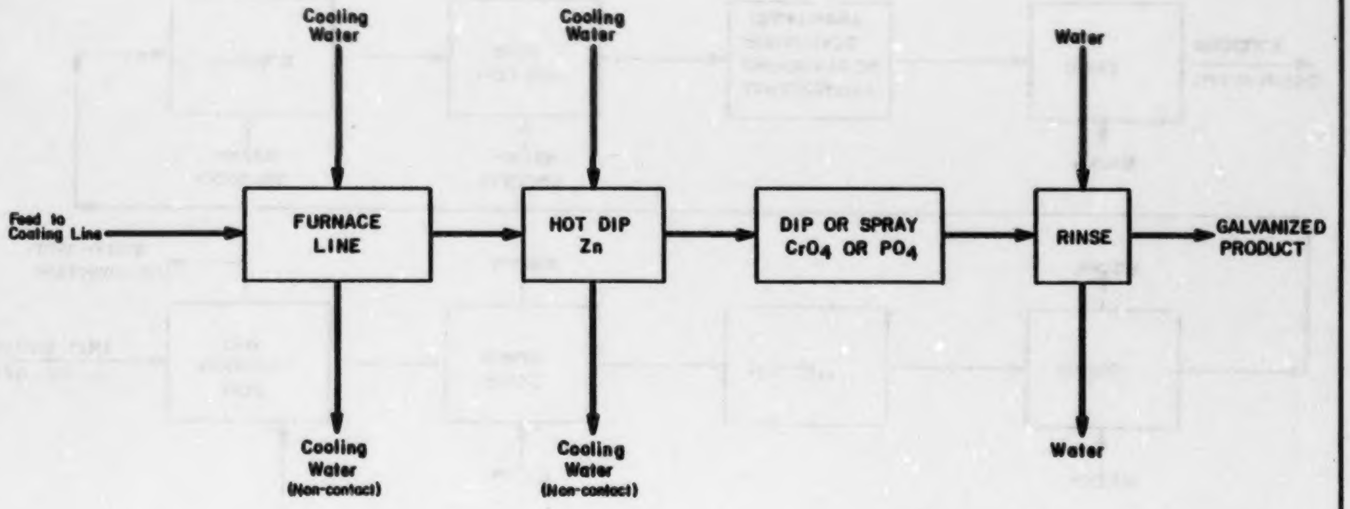

FEED TO COATING LINE
CLEANING SOLUTIONS
CHELATING AGENTS
WETTING AGENTS
CAUSTIC SODA
SODIUM PHOSPHATE
SODIUM SILICATE
HOT ALKALINE DIP
INTERMITTENT DISCHARGE
WATER
RINSE SCRUB
WATER
HCL DIP
WATER
RINSE
WATER
COOLING WATER
FURNACE
COOLING WATER (NON-CONTACT)
COOLING WATER
HOT DIP ZINC
COOLING WATER (NON-CONTACT)
DIP OR SPRAY CHROMATE OR PHOSPHATE TREATMENT
WATER
RINSE
WATER
GALVANIZED PRODUCT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING GALVANIZING (ZN)
TYPE II U.S. STEEL PROCESS
PROCESS FLOW DIAGRAM

DWG 2-6-74 REV 2 2-25-74
REV 1 2-19-74

FIGURE III-2

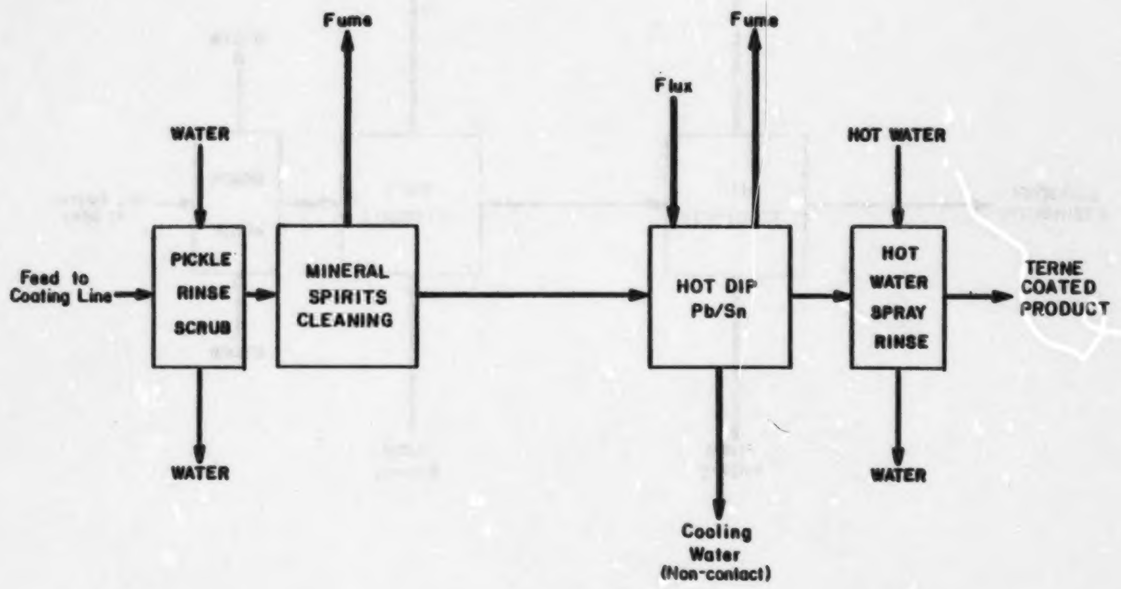

Feed to Cooling Line
Cooling Water
FURNACE LINE
Cooling Water (Non-contact)
Cooling Water
HOT DIP Zn
Cooling Water (Non-contact)
DIP OR SPRAY CrO_4 OR PO_4
Water
RINSE
Water
GALVANIZED PRODUCT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING GALVANIZING (Zn)
TYPE II
PROCESS FLOW DIAGRAM

Dwn. 2/22/79

FIGURE III-3

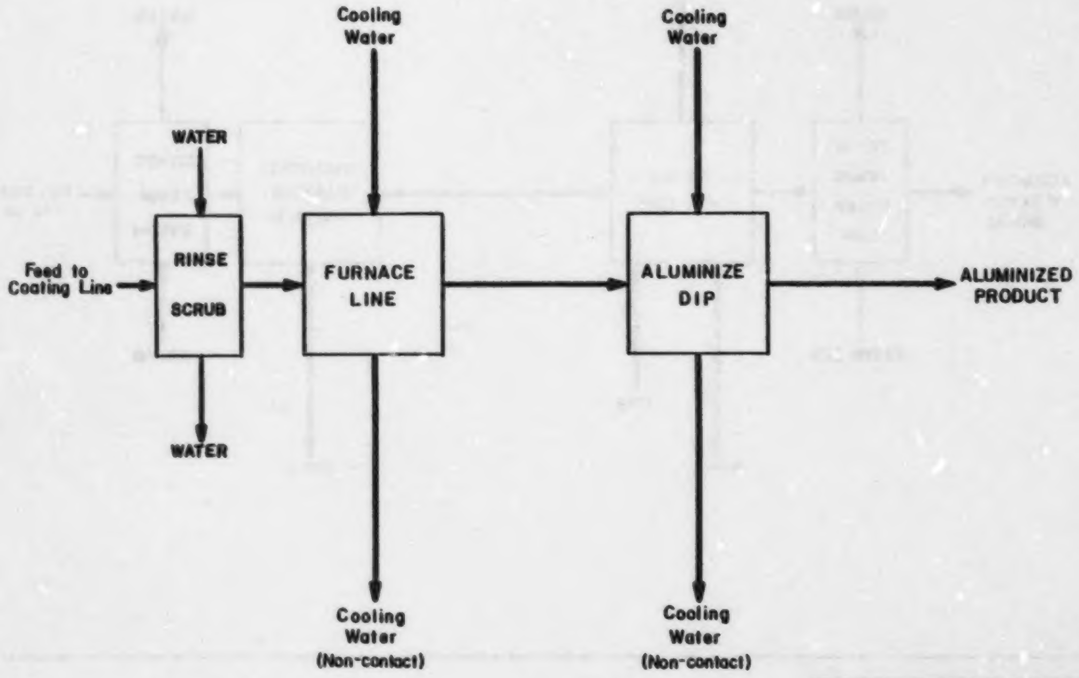

Feed to Coating Line
WATER
PICKLE
RINSE
SCRUB
WATER
Fume
MINERAL SPIRITS CLEANING
Flux
Fume
HOT DIP Pb/Sn
Cooling Water (Non-contact)
HOT WATER
HOT WATER SPRAY RINSE
WATER
TERNE COATED PRODUCT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING TERNE PLATE
PROCESS FLOW DIAGRAM

Dwn. 2/21/79

FIGURE III-4


WATER
Feed to Coating Line
RINSE
SCRUB
WATER
Cooling Water
FURNACE LINE
Cooling Water (Non-contact)
Cooling Water
ALUMINIZE DIP
Cooling Water (Non-contact)
ALUMINIZED PRODUCT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING ALUMINIZING
PROCESS FLOW DIAGRAM

Dwn. 2/21/79

FIGURE III-5

HOT COATING SUBCATEGORY

SECTION IV

SUBCATEGORIZATION

Plants involved in forming and finishing steel assume a wide variety of configurations, from simple layouts (e.g., a wire drawing operation starting with purchased rod or heavy wire brought in from elsewhere) to extremely complex (e.g., an integrated steel plant with all steel melting, refining, forming and finishing operations at a single site). Moreover, forming and finishing operations at any particular site may be of one type (pipe and tubemaking, cold rolling, coating), or may be a sequence involving many operations (primary breakdown of ingots into slabs, rolling of slabs into coils of strip, pickling and cold reduction of strip, cleaning and hot-dipping of strip to form a final galvanized product). The basic subcategorization of forming and finishing operations into subprocesses has been retained. This section deals with coating operations only, and in particular with hot dipped metallic coatings. Factors evaluated with respect to subcategorization and further subdivision are discussed below.

Factors Considered in Subcategorization

Manufacturing Process and Equipment

The manufacturing or production processes associated with the production of steel products serves as a basis for defining subcategories. The types of equipment used, and the processes themselves, vary sufficiently to justify their separation into different subcategories.

Coating operations within the steel industry are usually performed by either of the following methods:

Hot Dip Process

Steel is immersed in a molten bath of the coating metal, then removed from the bath in such a way that the coating is uniformly distributed over the metal surface as free of discontinuities as possible. Most zinc coatings, and all aluminum and terne (a lead/tin alloy) coatings are applied in this manner. In the past, tin was also applied as a hot-dipped coating, but the electrolytic tin plate process has almost completely supplanted this practice, except for hot dip coating of wire and wire products. Other metallic coatings which are applied by the hot dip process include aluminum, cadmium, lead, and combinations of these metals with each other or with zinc.

Electrolytic Process

Most tin coatings, all chromium coatings and some zinc coatings are applied electrolytically. These electrolytic coating operations have not been included in the iron and steel industrial category. The discharge from these operations will be addressed as part of the Metal Finishing industrial category.

Only hot dip coating operations are addressed herein. Since these operations are similar regardless of the type of metal coating being applied, manufacturing process does not warrant further subdivision of the hot coating subcategory.

Raw Materials

The primary raw material, carbon steel, is common to all hot coating operations covered in this subcategory. The Agency is unaware of operations coating specialty steels. However, the other different raw materials used in hot coating processes indicated a potential need to subdivide the hot coating subcategory by coating metal. In addition to the coating metals, the other raw materials used include fluxes and oils. (Pickling and alkaline cleaning normally conducted in conjunction with hot coating operations are addressed in separate subcategories). All terne coating and wire galvanizing lines surveyed were found to be using fluxes, as were virtually all galvanizing operations coating miscellaneous shapes. Fluxes are used in only 21% of strip and sheet galvanizing operations. Such differences indicated a potential need for subdivision of hot coating operations by the type of metallic coating being applied. However, the Agency evaluated the effluent data from operations coating with the different metals and found that the toxic metals present in the wastewaters from each of these operations were similar and appeared above treatability levels. Thus these wastewaters all require treatment, despite the varying levels of toxic metals present in these wastewaters. The only exception was the presence of hexavalent chromium in wastewaters from galvanizing operations with chromate rinses. As a result, the Agency subdivided the hot coating subcategory to separately limit galvanizing operations, and terne and other coating operations.

Final Products

A variety of final products are made when coatings are applied to different steel shapes. The most common hot coated products include galvanized steel strip, sheet, pipe, tube, rods, bars, fasteners, wire and wire products, nails, plate, couplings, and various structural shapes. Strip and sheet may in turn be formed into useful shapes, such as auto parts, architectural components, containers, gutters, and channels. In some cases, certain formed shapes are redipped into molten baths to ensure that the coatings are completely covering the base metal.

Hot coated products other than galvanized products include terne coated strip and sheet which is used for automobile parts, burial caskets, fire extinguishers, steel bands and roofing materials.

Aluminum coatings are applied to steel strip and sheet for decorative and corrosion resistant qualities. These flat products are then formed into architectural shapes, gutters, channels, auto body components, and other uses. Nails, bolts, nuts, fasteners, and wire are also aluminized by hot coating processes.

Wire and wire products (chain-link fence, wire cloth) are usually galvanized, but other hot coatings are also applied, namely tin, cadmium, aluminum, and combinations using tin, cadmium, and zinc. Another product involving combinations of metals is strip which has been coated with "galvalume", a combination of aluminum and zinc.

The large differences in the applied flow rates in relation to type of product being coated has led to further subdivision by product type, i.e., strip, sheet, and miscellaneous products, and wire products and fasteners. This is discussed in more detail below.

Wastewater Characteristics and Treatability

Wastewater characteristics and treatability are related to the coating metal. Except for hexavalent chromium, the Agency found that the wastewaters from all coating operations contain similar toxic metal pollutants. Although the predominant metal and the levels present varied by the type of coating applied, the toxic metal pollutants appeared above treatability levels. These toxic metals are amenable to the same treatment technologies, and regardless of the type of coating applied, the same effluent levels can be achieved.

Hexavalent chromium was found in the wastewaters from galvanizing operations with chromate rinses. Separate treatment of this wastewater is necessary to reduce the hexavalent chromium to the trivalent state. Subsequent removal of the trivalent chromium is accomplished using the same treatment technologies used for treating other toxic metal pollutants.

The Agency has concluded that wastewater characteristics and treatability warrant subdivision by product type, i.e., galvanizing, and terne and other metal coatings.

Size and Age

The Agency considered the impact of size and age on the need to further subdivide hot coating operations and found the impact to be much less signficant than the other factors evaluated. No impact from age of hot coating lines was found. Some of the most advanced wastewater treatment systems treat wastewaters from old coating lines. Very often wastewaters from a variety of finishing operations of varying ages and sizes are treated in the same system. Raw wastewater quality and treatability were likewise found to be unaffected by the age or size of a given hot coating line. Applied rinsewater and scrubber flow rates for all hot coating operations were compared with size and age (year of installation of the oldest active hot coating operation at the plant site) of the coating lines. Refer to Figures IV-1 and IV-3 for rinsewater and scrubber flows, respectively, reported by the industry for strip, sheet and miscellaneous products and to Figure IV-2 and IV-4 for the same flow information for wire product and fastener coating lines. As shown in the figures, no correlation exists between age and process flows. Plants of all "ages" appear to have both extremes of applied flow.

The figures for the applied rinse flow versus production capacity demonstrate that all coating operations, large and small, have comparable applied rinse flow rates within each product subdivision. Hence, no correlation exists between flow rates and size within the two product subdivisions. Flows (gal/ton) for wire products and fasteners tended to be 3 to 4 times those for strip, sheet and miscellaneous products. This difference is, however, addressed by subdivision of the subcategory by product type rather than by size.

Figures IV-1 and IV-2 also indicate that size is related to discharge mode, i.e., directly to a receiving stream or indirectly to a POTW. The large hot coating operations (strip, sheet, and larger miscellaneous shapes which are produced at rates exceeding 200 tons per turn) rarely discharge wastewaters to POTWs, while approximately 40% of the wire and wire products lines discharge to municipal treatment plants. Such differences are accounted for in the development of separate effluent limitations and standards for the wire products and fasteners segment. Thus, subdivision by size becomes unnecessary since potential size-related distinctions have been covered by subdivision according to type of product being coated. Size and age in themselves do not affect the attainability of the final limitations and standards.

The Agency also investigated the effect of age on the feasibility and cost of retrofitting pollution control equipment at hot coating lines. Comparison of the age of a hot coating line with the year in which pollution control facilities were installed (see Table IV-1), demonstrate that pollution control equipment can be retrofitted. As noted above, the wastewater characteristics and treatability are the same for old and new operations. Additionally, no differences were found in the effluent from facilities treating wastewaters from plants of all ages. As a result, the Agency has concluded that retrofitting wastewater pollution control systems to hot coating operations is feasible.

The actual costs of retrofitting wastewater treatment systems to existing production units were acquired from industry as part of detailed data collection portfolios (D-DCPs). Operators were asked to identify costs which would not have been incurred if treatment was installed concurrently with production units or during major rebuilds of production facilities. Nine plants responded to this portion of the D-DCP. Four plants could not determine retrofit costs for hot coating treatment since a central treatment plant had been installed, and costs, if any, could not be segregated. No retrofit costs were reported for two plants, the smallest galvanizer and a terne coating line. In one case, a lagoon was added to an existing treatment facility, but this was considered by the plant to be an upgrading cost, not a retrofit cost. Retrofit costs for the remaining three plants were listed as unknown. One of these plants with a central treatment system with installation costs of $1,650,000 estimated that 25-50 percent could be saved if a greenfield treatment system was built adjacent to the production units. Treatment had to be installed 1500 to 2000 feet from the wastewater sources, most of which were acid pickling operations. The Agency estimates that $670,000 of the $1,650,000 investment cost for this central treatment plant is attributable to the treatment of hot coating wastewaters. On the basis of model treatment system (see Section VIII), the Agency also estimated that the costs for treating the wastewaters from the hot coating operations at this site amount to $974,500. This cost is 45 percent greater than plant reported costs. Even though plant personnel estimate that 25-50 percent of their costs are attributable to "retrofit", the money spent is considerably less than the Agency's estimated costs based on the treatment models used throughout this study. It is likely that a portion of the so-called "retrofit" costs are really site-specific costs. New plants have, in the past, constructed central treatment systems at considerable distances from the wastewater sources (e.g., Plants 0856F and 0112D).

A similar situation was reported by Plant 118(NN-2). Initial investment costs reported for this plant treating galvanizing wastewater alone, were $1,500,930. This compares with the Agency's estimated cost of $1,575,300 based on model costs. This treatment plant is also situated a considerable distance from the production units, yet reported costs were 5% less than the model-based estimates. Hence, the Agency's model-based cost estimates are sufficient to cover site-specific and retrofit costs for both separate and central treatment systems. The Agency concludes that older plants do not incur any unique or substantial costs to retrofit pollution control equipment.

Based upon the above, the Agency finds that both old and newer production facilities generate similar raw wastewater pollutant loadings; that pollution control facilities can be and have been retrofitted to both old and newer production facilities without substantial retrofit costs; that these pollution control facilities can and are achieving the same effluent quality; and, that further subcategorization or further segmentation within this subcategory on the basis of age is not appropriate. Additionally, the Agency concluded that size has no significant effect on further subdivision or segmenting of the subcategory.

Geographic Location

Hot coating operations are widespread, with no significant distinctions noted due to geographic location. DCP respondents included plants from twenty-one different states, and a recent membership list of the American Hot Dip Galvanizers Association indicates that galvanizing is practiced in forty-one different states. However, about 60% of all hot coating operations are situated in four states - Pennsylvania, Illinois, Ohio and California. Since operations are nearly always confined within an enclosed building, the effects of climate and adverse weather are greatly minimized. Special consideration of water problems for "arid" or "semi-arid" regions is not appropriate since the model treatment systems do not result in significant water consumption. Plants located in "arid" or "semi-arid" regions are presently operating coating lines and wastewater treatment systems comparable to those employed in other parts of the nation and will have no unusual problems in upgrading existing systems. Hence, the Agency concluded that further subdivision of the hot coating subcategory based upon geographic location is not warranted.

Process Water Usage

The Agency reviewed the process water applied rates and effluent discharge rates using data obtained from industry in the DCPs. This review revealed that the rinsewater application and discharge rates are related to product type, as discussed previously. Operations coating fasteners, rods, wire and wire products reported uniformly higher rinsewater flow rates than operations coating strip, sheet, pipes, tubes and other miscellaneous products. The higher flow rates for the former products are related to the larger surface area per unit of weight associated with these products. The rinse water flow rates within these product groupings do not vary substantially with the type of metal coating. As a result of the difference in rinsewater flows, the Agency subdivided the hot coating subcategory into two product groupings, i.e., sheet, strip and miscellaneous products and wire products and fasteners. The flow allowances for rinsewaters are established on a gallon per ton of product basis, since these flows are related to the production rate.

The wastewater discharges from fume scrubbers were also evaluated. The Agency determined that these scrubber water discharges are not related to product type nor to production rates. In addition, the Agency concluded that no definitive correlation exists between these discharges and the design gas flow rate through the scrubbers, or scrubber type. As a result, the Agency established a separate subdivision for fume scrubber discharges and set the discharge flow allowance on a gallon per minute basis. The effluent limitations and standards for this subdivision are established on a daily mass basis. These limitations are to be added to the limitations for rinsewater discharges, where fume scrubbers are installed.

The subdivisions selected by the Agency for the hot coating subcategory are as follows:

Galvanizing Coating Operations

- Strip, sheet, and miscellaneous products
- Wire products and fasteners

Terne Coating Operations

Other Metal Coating Operations

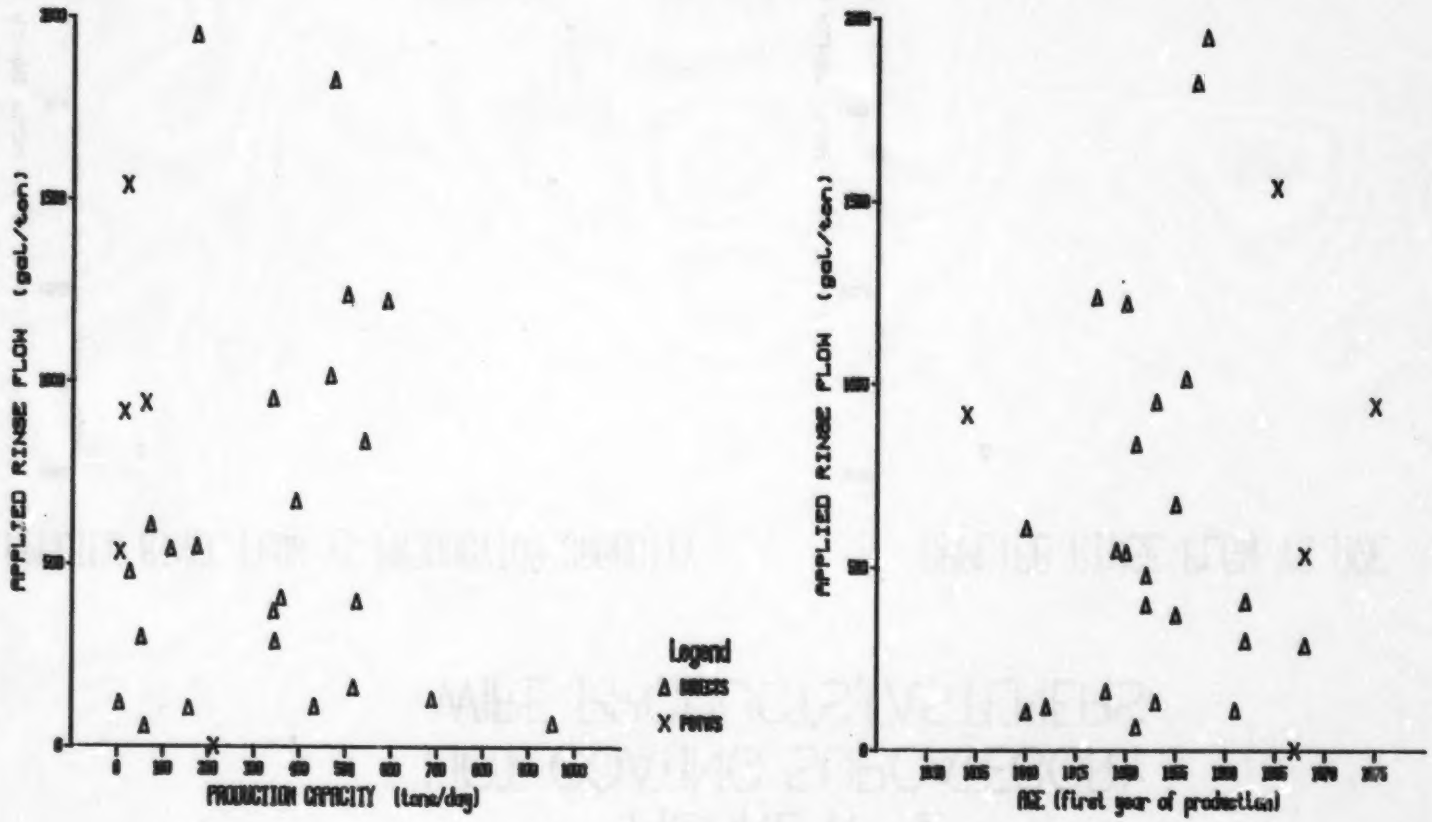
- Strip, sheet, and miscellaneous products
- Wire products and fasteners

TABLE IV-1

HOT COATING PLANTS THAT HAVE DEMONSTRATED THE ABILITY TO RETROFIT POLLUTION CONTROL EQUIPMENT

Plant Reference Code	Product	Coating Operation	Plant Age (Year)	Treatment Age (Year)
0112B	Strip	Galvanizing	1962	1971
0112G	Fasteners	Galvanizing	~1930	1973
0112I	Fasteners	Galvanizing	1922	1977
0112I	Fasteners	Aluminizing	1955	1977
0384A	Strip	Galvanizing	1951	1970
0384A	Strip	Aluminizing	1961	1970
0448A	Sheet	Galvanizing	1967	1970
0460A	Wire	Galvanizing	1930	1968
0476A	Wire	Galvanizing	~1930	1977
0476A	Pipe	Galvanizing	1930	1977
0492A	Pipe	Galvanizing	1962	1976
0580A	Wire Cloth	Galvanizing	1962	1967
0584C	Strip	Galvanizing	1956	1965
0640	Fencing	Galvanizing	1936	1961
0640	Wire	Galvanizing	1936	1961
0856D	Strip	Terne Coating	1964	1979
0856D	Strip	Galvanizing	1947	1979
0856D	Strip	Other (Al/Zn)	1949	1979
0868A	Sheet	Galvanizing	1948	1977

FIGURE IV-1
HOT COATING SUBCATEGORY
STRIP,SHEET,MISC.



APPLIED RINSE FLOW VS PRODUCTION CAPACITY

APPLIED RINSE FLOW VS AGE

FIGURE IV-2
HOT COATING SUBCATEGORY
WIRE PRODUCTS,FASTENERS

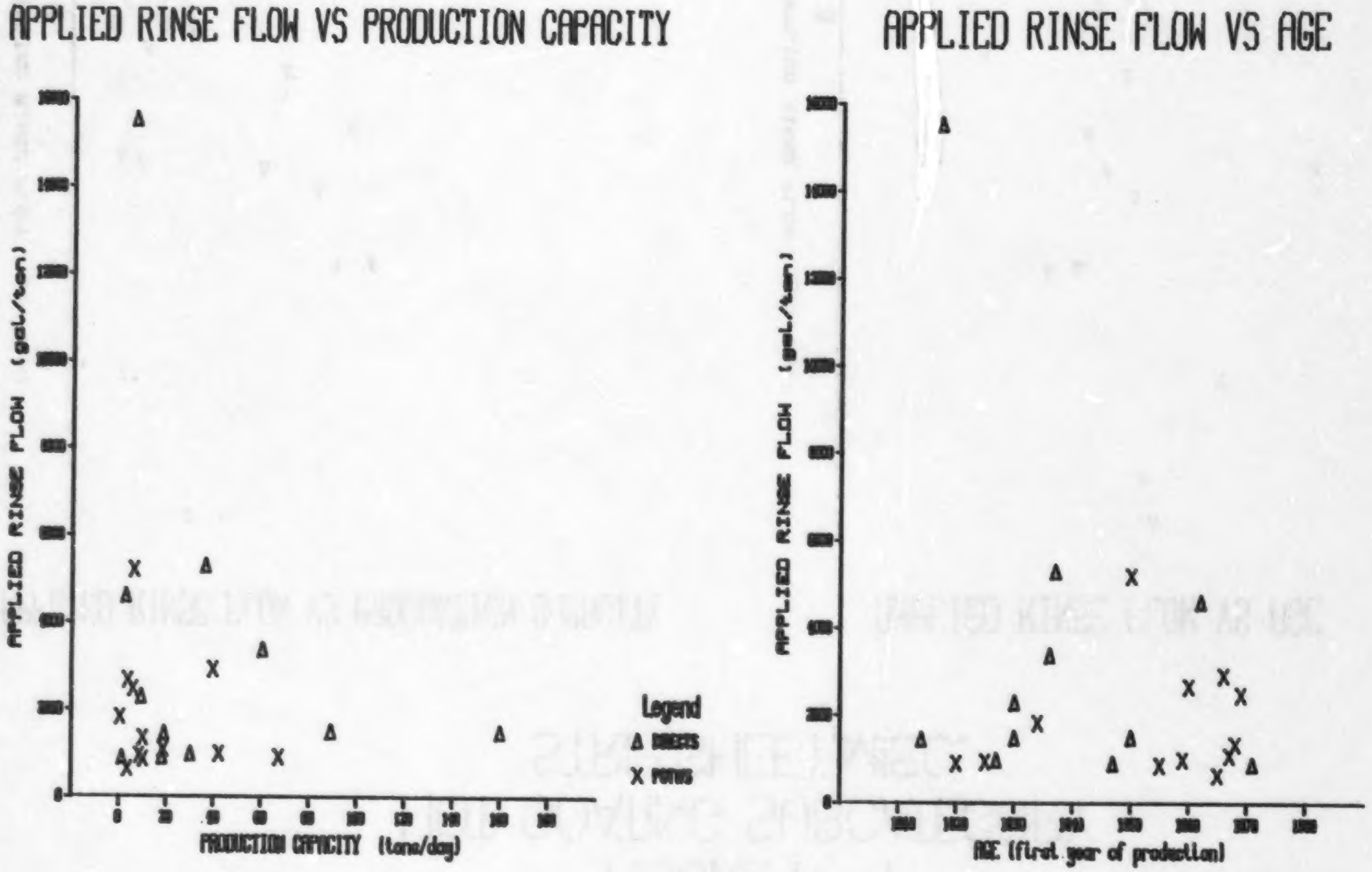
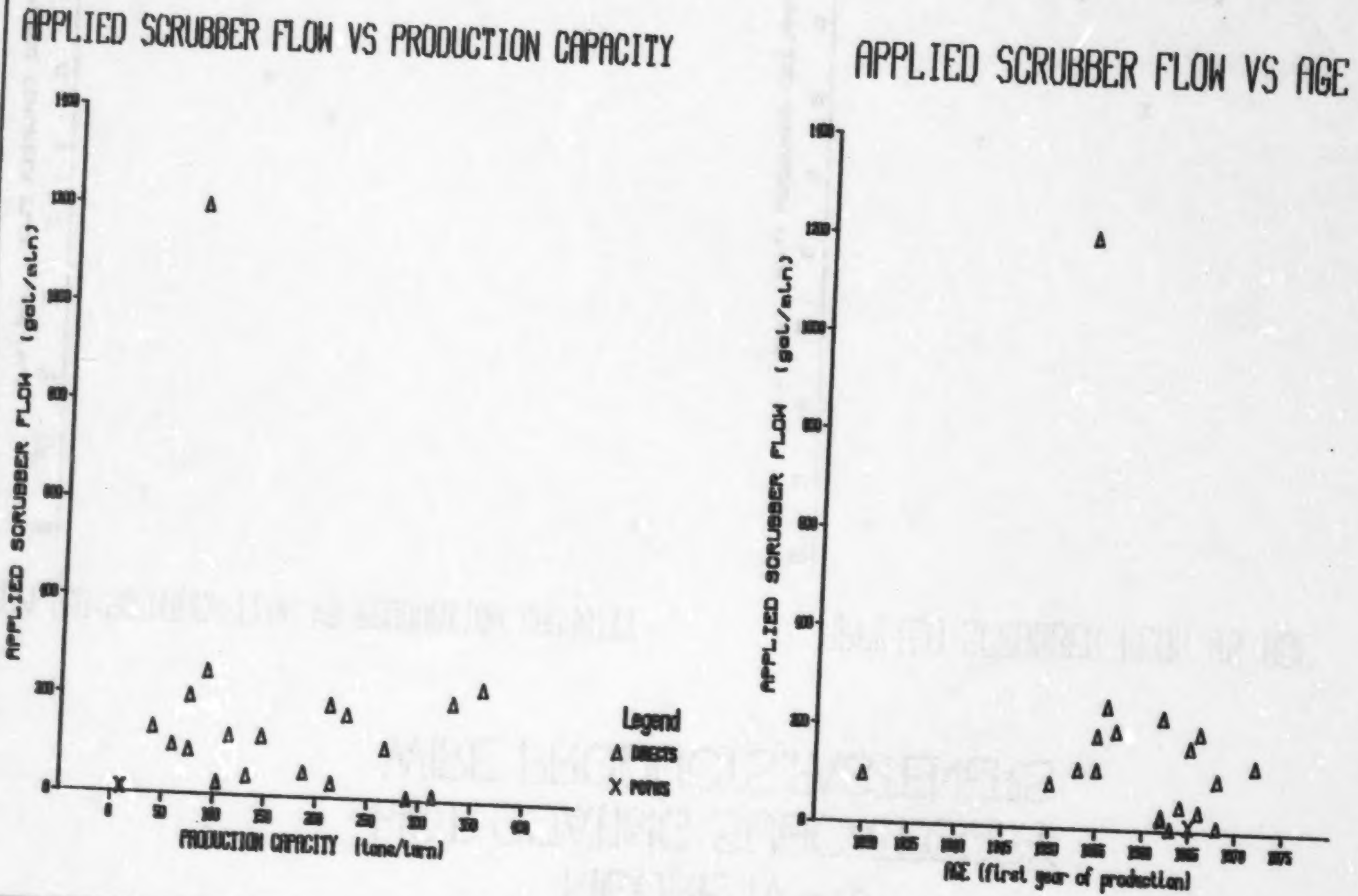


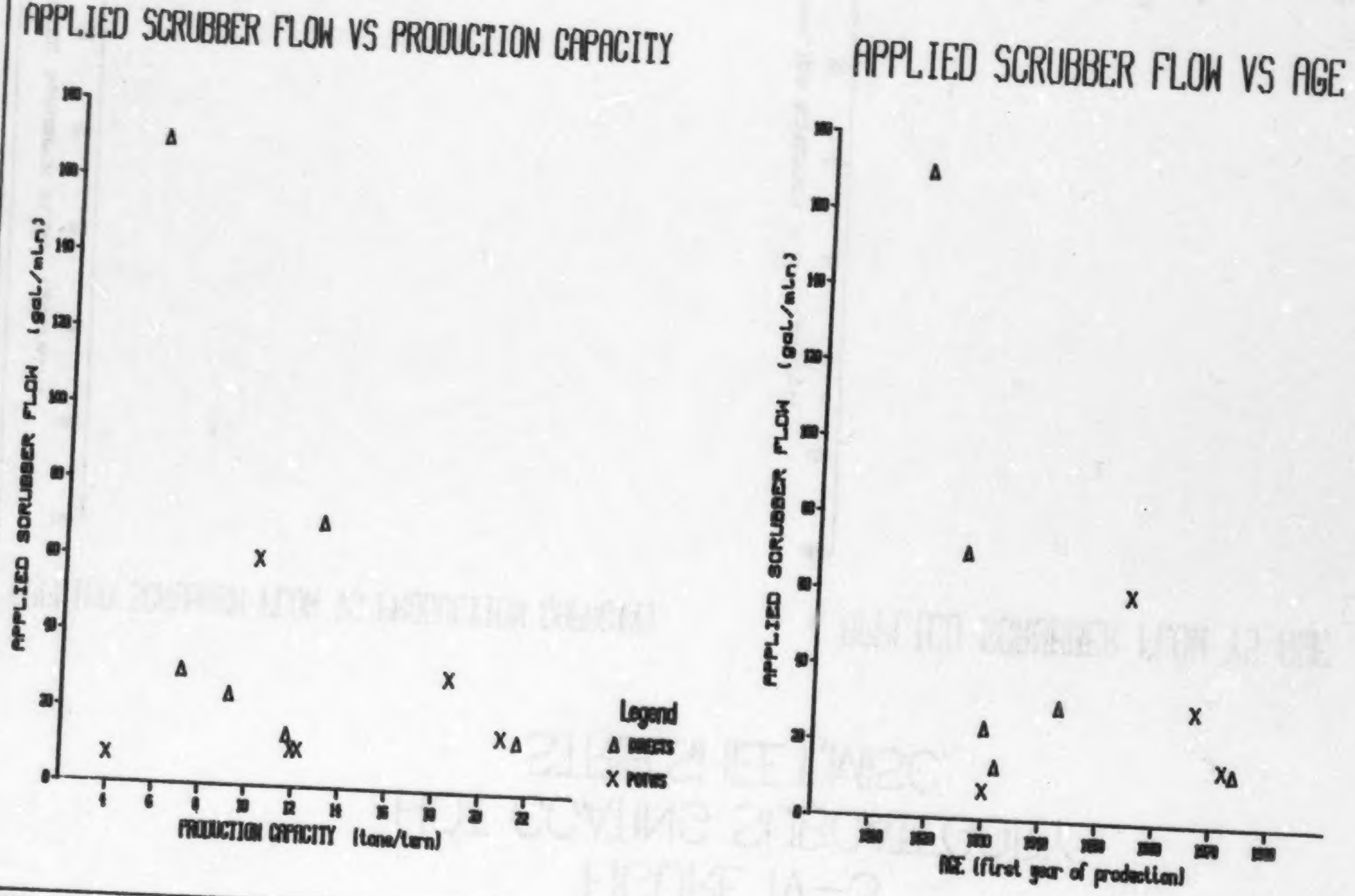
FIGURE IV-3
HOT COATING SUBCATEGORY
STRIP,SHEET,MISC.



APPLIED SCRUBBER FLOW VS PRODUCTION CAPACITY

APPLIED SCRUBBER FLOW VS AGE

FIGURE IV-4
HOT COATING SUBCATEGORY
WIRE PRODUCTS,FASTENERS



HOT COATING SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERIZATION

The Agency evaluated process water use and total wastewater volumes based upon data obtained from the basic DCP responses received for most domestic hot coating operations. Where fume scrubbers are used, the Agency determined the additional wastewater volumes and quality attributable to fume scrubber operation. The Agency identified existing wastewater control and treatment technology for each plant, and determined the disposal method for process wastewaters.

Wastewater characterization is based upon monitoring data obtained during field sampling programs. Additional pollutant load, effluent quality and cost data were sought for nine hot coating operations through detailed data collection portfolios (D-DCPs).

Water use rates discussed below pertain only to process wastewaters, and do not include noncontact or nonprocess cooling waters.

Water Use in Hot Coating Operations

Variations in applied water flow rates are shown in Tables III-1 through III-3 for the various hot coating operations. Figures III-1 through III-5 illustrate why such variations are necessary. Note that Figure III-1 (galvanizing) depicts at least eight potential sources of process wastewaters including two mild pickling steps; a three stage alkaline cleaning intermediate step; and, at least one source of noncontact cooling water. Total wastewater flow from this line would be quite high. On the other hand, Figure III-3 also depicts a galvanizing operation with only three potential sources, and two of these three are noncontact cooling water. The actual process wastewater flow from this line would be a fraction of the flow from the line shown in Figure III-1, yet both could be producing galvanized ware of comparable size, shape and quantity.

Line configuration is determined by product requirements, as are the number and nature of the intermediate steps in the process. As the process becomes more complex, the opportunity arises to reduce flows by recycle of a portion of the wastewater, and at the same time recover chemical values. An example appears in Figure III-1, where three consecutive steps in preparing the product for final coating involve the use of alkaline cleaners. Note that wastewater overflows from the hot electrolytic alkaline cleaning tank for reuse in the hot alkaline scrubber, which in turn is reused as makeup to the hot alkaline dip tank. Instead of three separate wastewater discharges from this cleaning step, each contributing high levels of alkalis and phosphates, a single intermittent discharge occurs. Such flow reduction and chemical conservation techniques can be used to minimize the total process wastewater discharge from complex coating lines. Discharges from acid pickling and alkaline cleaning operations are subject to the limitations established for those subcategories. Only rinse waters and fume scrubber waters from the coating operations are subject to the limitations established for the hot coating subcategory.

The major wastewater flows originating from hot coating operations in the steel industry fall into several distinct groupings:

1. Continuously running dilute rinse waters from rinses following chemical treatment or surface passivation steps; and, final product rinses after hot dipping. These waters contain suspended and dissolved solids, chlorides, sulfates, phosphates, silicates, oily matter, and varying amounts of dissolved metals (iron, zinc, chromium, lead, tin, aluminum, cadmium) depending on which coating metal is used.

2. Concentrated intermittent discharges (including fluxes), chemical treatment solutions, and regenerant solutions from in-line ion exchange systems. These discharges contain higher concentrations of the pollutants noted above. Discharge volumes from these sources can be minimized by close attention to maintenance and operating conditions, and through provision of dragout recovery units. Hot dipped coating baths themselves are never discharged. Instead, they are recovered and continuously regenerated as part of the coating operation, or sold to outside contractors for processing and recovery.

3. Fume scrubber wastewaters produced by the continuous scrubbing of vapors and mists collected from the coating steps. Scrubbers may be once-through or recirculating, and produce wastewaters that may be used as process rinses, since only volatile components are present in the air to be scrubbed. Less than 40 percent of all hot coating lines have wet fume scrubbers. A few plants have dry fume absorbers. Vapor and mist control for some coating operations include tank covers or fans to divert fumes out of the work area.

Applied Flow Rates

Responses to DCPs were reviewed for applied rinse and fume scrubber flow rates. Separate compilations were made for various final coated products and for direct and POTW dischargers. Data are summarized in Table V-1 in terms of gallons of process water applied per ton of coated product for the rinses and in gallons per minute for the fume scrubbers. Wire products and fasteners have consistently higher average flow rates than do strip, sheet or miscellaneous shapes. The Agency could not determine whether this is due entirely to rinsing requirements, or to a greater likelihood for wire mills to include noncontact cooling waters in DCP responses. In either case, some wire mills were operating successfully with considerably less water. However, even a comparison of minimum applied flows bears out the fact that wire and related products require more water than strip, sheet or miscellaneous shapes. In addition to surface area, another contributing factor may be that all but one out of 83 wire mills use fluxes, thus increasing the rinsing requirements, while only 20% of the strip and sheet mills use fluxes. For these reasons, the Agency has promulgated limitations and standards for wire and related products which are based upon the higher water usage rates observed.

Unlike the rinse waters, the fume scrubbers were found to be unrelated to product type or production rates. In addition these discharges could not be correlated with design gas flow through the scrubbers or the type of scrubber used. Consequently, the fume scrubber flows are expressed as gallon per minute and the limitations and standards in terms of a mass loading of kg per day.

Wastewater Characterization

The Agency obtained information on wastewater quality from sampling programs at eleven selected hot coating operations, two of which were revisited two years after an initial sampling survey. The Agency also solicited long-term data for nine hot coating operations. A summary of pollutants found in galvanizing, terne-coating and aluminizing operation wastewaters is shown in Tables V-2, V-3 and V-4 respectively.

The large variations in the levels of most pollutants as shown in the tables are due mainly to coating line configuration. For example, molten lead is used at some plants to anneal wire products prior to coating. If a pickling or rinsing step follows lead annealing, considerable lead may be found in the wastewater. Otherwise, lead is present only as a contaminant in the zinc metal used for coating. Zinc was found only at low levels at several of the galvanizing lines listed. In those cases where zinc content is high in the raw wastewaters, it is often the result of the repickling and coating of a previously galvanized product which failed to pass inspection. Similar relationships were noted for chromium and nickel.

Relatively low concentrations of toxic organic pollutants were found in raw wastewaters from all hot coating operations during the toxic pollutant survey. The phthalates and methylene chloride were universally present, but the Agency believes that they are attributable to sampling and analytical techniques. The remaining toxic organic tended to be present in plant intakes at levels equal to or greater than those found in hot coating wastewaters. In any event these toxic pollutants appear at levels below treatability. Therefore, as noted in Section VI, these pollutants were not selected for regulation.

TABLE V-1

PROCESS WATER APPLIED FLOW RATES - HOT COATING OPERATIONS

Coating Operations	No. of Lines	Rinsewater in gal/ton of Product			No. of Scrubbers	Fume Scrubber Flow in GPM		
		Maximum	Minimum	Avg.		Maximum	Minimum	Avg.
A. Strip, Sheet & Miscellaneous Products:								
Galvanizing	52	3,646	0.95	743	21	1,200	5	151
	48(1)	1,951	0.95	595	20(2)	250	5	98
Terne Coating	6	2,567	301	863	3	200	25	92
	5(3)	670	301	522	3	200	25	92
Other Coating	4	558	16	279	-	-	-	-
	3(4)	558	16	345	-	-	-	-
All SSM	62	3,646	0.95	725	24	1,200	5	144
	56	1,951	0.95	575	23	250	5	97
B. Wire Products and Fasteners:								
Galvanizing	58	15,540	451	2,655	12	170	7.5	38
	56(5)	6,761	451	2,356	12	170	7.5	38
Other Coating	15	10,800	300	2,759	3	120	120	120(7)
	14(6)	7,200	300	2,184	3	120	120	120(7)
All WPF	73	15,540	300	2,676		170	7.5	55
	70	7,200	300	2,322	15	170	7.5	55

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(1) Omits lines 0584F-02; 0684F-02; 0856F-02 and 0864B-03. All four lines are 3.4 to 6.1 times higher than average of other flows.

(2) Omits scrubber at line 0856F-02. Flow is 8 times higher than average of other flows, and 4.8 times higher than the next highest flow.

(3) Omits line 0856D-02. Flow is 4.9 times higher than average of other flows, and 3.8 times higher than next highest flow.

(4) Omits line 0792B. Production is one-two hundredth of the next smallest line, and is not typical of other SSM coaters.

(5) Omits lines 0856P and 0860G-01. Flows are 3.5 to 6.6 times higher than average of other flows.

(6) Omits lines 0860F-04. Flow is 4.9 times higher than average of other flows. Plant closed permanently in 1979.

(7) Plant 0860F-04 was the only line in this subdivision which had fume scrubbers. Plant closed.

TABLE V-2

NET RAW WASTEWATERS - HOT COATING GALVANIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

TOXIC POLLUTANT SURVEY

	Plant Codes	0612		0396A		0948C		0112I		0920G$^{(1)}$		0476A		Average	
	Sample Point(s)	111 $J^{(2)}$		112 D		114 B		116 D		118 C		119 D			
	Flow, gal/ton	1414		287		211		592		1177$^{(2)(3)}$		147		Toxic Survey Only	
	Product	Wire		Strip/Sheet		Strip		Fasteners		Strip/Sheet		Pipe			
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Suspended Solids	67	0.395	326	0.390	104	0.0914	127	0.313	74	0.363	5	0.00306	117	0.259
	Oil and Grease	20	0.118	13	0.0155	208	0.183	16	0.0395	46	0.226	5	0.00306	51	0.0975
	Hexavalent Chromium	0.002	0.000012	0.015	0.000018	6.7	0.00590	0.002	0.000005	0.003	0.000015	0.002	0.000001	1.12	0.00099
	pH, units	7.4-7.5	-	1.7-1.8	-	6.7-7.9	-	3.2-3.7	-	2.3-2.6	-	8.3	-	1.7-8.3	-
4	Benzene	ND	ND	ND	ND	ND	ND	0.00	0.0000	0.004	0.000020	0.00	0.0000	0.001	0.000003
11	1,1,1 Trichloroethane	0.067	0.000395	ND	ND	0.010	0.000009	ND	ND	0.00	0.0000	ND	ND	0.011	0.000066
23	Chloroform	0.015	0.000088	<0.010	<0.000012	<0.010	<0.000009	0.007	0.000017	0.074	0.000363	0.068	0.000042	0.027	0.000085
26	1,3 Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	0.153	0.000750	ND	ND	0.026	0.000125
39	Fluoranthene	ND	ND	0.019	0.000023	<0.010	<0.000009	0.00	0.0000	0.015	0.000074	0.00	0.0000	0.006	0.000014
44	Methylene Chloride	0.115	0.000677	0.012	0.000014	0.016	0.000014	0.018	0.000044	2.50	0.0123	<0.010	<0.000006	0.444	0.00218
64	Pentachlorophenol	ND	ND	ND	ND	0.022	0.000019	0.00	0.0000	ND	ND	ND	ND	0.004	0.000003
66	Bis-(2-ethyl hexyl) phthalate	0.086	0.000506	0.307	0.000367	0.156	0.000137	0.053	0.000131	0.031	0.000152	<0.105	0.000064	0.106	0.000216
67	Butyl benzyl phthalate	ND	ND	0.00	0.0000	0.005	0.000004	0.010	0.000025	0.041	0.000201	0.00	0.0000	0.009	0.000038
68	Di-n-butyl phthalate	ND	ND	0.043	0.000051	0.021	0.000018	0.020	0.000049	0.031	0.000152	<0.010	<0.000006	0.019	0.000045
69	Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	0.057	0.000280	ND	ND	0.010	0.000047
70	Diethyl phthalate	0.00	0.0000	ND	ND	0.010	0.000009	0.006	0.000015	ND	ND	ND	ND	0.003	0.000004
71	Dimethyl phthalate	0.00	0.0000	0.010	0.000012	0.010	0.000009	0.00	0.0000	0.019	0.000093	ND	ND	0.007	0.000019
85	Tetrachloroethylene	0.008	0.000047	<0.010	<0.000012	0.00	0.0000	0.005	0.000012	0.008	0.000039	ND	ND	0.004	0.000016
87	Trichloroethylene	0.046	0.000271	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008	0.000045
115	Arsenic	NA	NA	0.03	0.000036	NA	NA	NA	NA	0.021	0.000103	NA	NA	0.026	0.000070
119	Chromium	0.14	0.000824	0.22	0.000263	10.2	0.00898	0.10	0.000247	2.92	0.0143	<0.025	<0.000015	2.27	0.00412
120	Copper	0.06	0.000353	2.5	0.00299	0.01	0.000009	0.19	0.000468	0.12	0.000589	0.01	0.000006	0.48	0.000736
121	Cyanide	0.007	0.000041	0.02	0.000024	0.014	0.000012	0.006	0.000015	0.019	0.000093	0.006	0.000004	0.012	0.000031
122	Lead	0.20	0.00118	25	0.0299	<0.05	<0.000044	0.19	0.000468	<0.06	<0.000294	0.41	0.000251	4.30	0.00530
124	Nickel	0.03	0.000177	1.3	0.00155	0.02	0.000018	0.09	0.000222	<0.50	<0.00245	<0.02	<0.000012	0.24	0.00033
126	Silver	<0.02	<0.000118	0.05	0.000060	<0.02	<0.000018	<0.02	<0.000049	<0.25	<0.00123	<0.02	<0.000012	0.008	0.00001
128	Zinc	3.2	0.0188	50	0.0598	0.65	0.000572	15	0.0370	82.0	0.402	2.7	0.00165	25.6	0.0866
	Total Iron	NA	NA	NA	NA	NA	NA	97	0.239	10.5	0.0515	NA	NA	54	0.145
	Dissolved Iron	5.0	0.0295	195	0.233	0.04	0.000035	78	0.192	9.0	0.0441	0.03	0.000018	48	0.0831

TABLE V-2
NET RAW WASTEWATERS - HOT COATING GALVANIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
PAGE 2

						ORIGINAL SURVEY							
Plant Code	0856P		0936		0856F		0920E(1)		Average Original Survey Only		Overall Average	
Sample Point(s)	I-2		V-2		NN-2		NN-2					
	4		2+3		4+8+9		3					
Flow, gal/ton	220		1655		699(3)		1233(2)(3)					
Product	Wire		Wire		Sheet		Sheet/Strip					
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	96	0.0881	16.2	0.112	88	0.256	111	0.571	77.8	0.257	101	0.258
Oil and Grease	4	0.00367	4.2	0.0290	48	0.140	21	0.108	19.3	0.0702	39	0.0866
Hexavalent Chromium	NA	NA	NA	NA	0.003	0.000009	0.011	0.000057	0.007	0.000033	0.842	0.000752
pH, Units	4.5-5.0		1.8-8.7		1.2-11.2		2.6	-	1.2-11.2		1.2-11.2	
115 Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.026	0.000070
119 Chromium, Total	NA	NA	NA	NA	4.5	0.0131	1.77	0.00910	3.1	0.0111	2.48	0.00586
120 Copper	NA	NA	NA	NA	0.22	0.000641	0.05	0.000257	0.14	0.000449	0.395	0.000664
121 Cyanide	NA	NA	NA	NA	0.005	0.000015	0.039	0.000200	0.022	0.000108	0.0145	0.000050
122 Lead	NA	NA	37.7	0.260	0.10	0.000291	0.26	0.00134	12.7	0.0872	7.10	0.0326
124 Nickel	NA	NA	NA	NA	0.027	0.000079	0.043	0.000221	0.035	0.000150	0.189	0.000285
126 Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.008	0.00001
128 Zinc	NA	NA	NA	NA	0.2	0.000583	145	0.745	73.1	0.376	37.3	0.159
Total Iron	33.2	0.0306	197	1.36	15.4	0.0449	11.6	0.0596	64.3	0.374	60.8	0.298
Dissolved Iron	7.1	0.00651	203	1.40	0.043	0.000125	9.0	0.0462	54.8	0.363	50.7	0.196

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(1) Plant was sampled during both surveys.
(2) Flow includes non-contact cooling waters.
(3) Flow includes fume scrubber waters.

NA: Not Analyzed
NA: Not Detected

TABLE V-3

NET RAW WASTEWATER - HOT COATING - TERNE
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

		TOXIC POLLUTANT SURVEY		ORIGINAL SURVEY			
	Plant Codes	0856D[(1)] 113		0060 00-2		0856D[(1)] PP-2	
	Sample Point	C		4		2	
	Flow, gal/ton	1006(2)(3)		516		2194(2)(3)	
	Product	Sheet/Strip		Sheet/Strip		Sheet/Strip	
		mg/l	lbs/1000 lb	mg/l	lbs/1000 lb	mg/l	lb/1000 lb
	Suspended Solids	11	0.0461	50	0.108	8	0.0732
	Oil and Grease	4	0.0168	3	0.00646	4.3	0.0393
	Tin	<0.4	<0.00168	<2	<0.00430	<2	<0.0183
	pH	5.2-6.5	---	2.2-4.1	-	3.6-5.2	---
23	Chloroform	0.053	0.000222	NA	NA	NA	NA
44	Methylene Chloride	2.50	0.0105	NA	NA	NA	NA
65	Phenol	0.011	0.000046	NA	NA	NA	NA
66	Bis-(2-ethyl hexyl) phthalate	0.011	0.000046	NA	NA	NA	NA
85	Tetrachloroethylene	0.014	0.000059	NA	NA	NA	NA
119	Chromium	2.68	0.0112	0.01	0.000022	0.16	0.00146
120	Copper	0.040	0.000168	0.03	0.000065	<0.02	<0.000183
122	Lead	0.067	0.000281	0.25	0.000538	0.017	0.000156
124	Nickel	0.590	0.00247	0.06	0.000129	0.027	0.000247
128	Zinc	0.062	0.000260	1.05	0.00226	0.11	0.00101
	Iron, Total	12.0	0.0503	108.8	0.234	20.3	0.186
	Iron, Dissolved	4.4	0.0185	74.3	0.160	14.9	0.136

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(1) Plant was sampled during both surveys
(2) Flow includes non-contact cooling water
(3) Flow includes fume scrubber water
NA: Not analyzed.

TABLE V-4

NET RAW WASTEWATER - HOT COATING - ALUMINIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

TOXIC POLLUTANT SURVEY

Plant Codes	0112I 116
Sample Point(s)	E
Flow, gal/ton	3882
Product	Fasteners

		mg/l	lbs/1000 lb
	Suspended Solids	231	3.74
	Oil and Grease	19	0.308
	Aluminum	12	0.194
	Hexavalent Chromium	0.002	0.000032
	pH	6.4-10.5	-
44	Methylene Chloride	0.015	0.000243
66	Bis-(2-ethyl hexyl) phthalate	0.052	0.000842
67	Butyl benzyl phthalate	0.060	0.000971
68	Di-n-butyl phthalate	0.038	0.000615
70	Diethyl phthalate	0.011	0.000178
118	Cadmium	<0.01	<0.000162
119	Chromium	0.10	0.00162
120	Copper	0.21	0.00340
122	Lead	0.39	0.00631
128	Zinc	0.35	0.00567
124	Nickel	0.18	0.00291
	Iron, Dissolved	49	0.793

HOT COATING SUBCATEGORY

SECTION VI

WASTEWATER POLLUTANTS

For hot coating operations, the pollutants limited in the original regulation were oil and grease, suspended solids, lead, chromium (total and hexavalent), tin, zinc, and pH. As a result of the toxic pollutant survey and the addition of other hot coating operations besides galvanizing and terne coating, other pollutants, (e.g. aluminum, cadmium, copper, dissolved iron and nickel) were considered for addition to the list of selected pollutants in certain hot coating alternative treatment systems. The Agency also found other pollutants to be present in significant quantities in hot coating wastewaters (e.g., chlorides, sulfates, dissolved solids), but did not consider limitations for them. In general, these pollutants are not toxic and difficult to remove. Treatment for these pollutants is not commonly practiced in any industry.

Raw wastewater quality and treated effluent characteristics are described in detail in Sections V and VII. Refer to Tables V-2 and VII-2 for galvanizing, Tables V-3 and VII-3 for terne coating, and Tables V-4 and VII-4 for aluminizing.

Conventional Pollutants

The Agency originally promulgated limitations for suspended solids, oil and grease and pH in 1976. Suspended solids not only are routinely present in raw wastewaters, but also are generated during treatment, as dissolved metals are precipitated out of solution. Thus, effective removal of suspended solids minimizes the discharge of toxic metal pollutants.

Oil and grease was selected for limitation because of the use of lubricants and oil baths in the hot coating processes. Sampling indicated the presence of oil and grease at concentrations up to 200 mg/l.

Finally pH was chosen primarily because of the detrimental effect of extremes in pH levels, and because control of pH significantly affects the removal of dissolved metals. Without such control, unacceptable discharges of toxic metals could occur.

These pollutants are common to all hot coating operations. Thus, effluent limitations and standards for these pollutants have been promulgated at the BPT, BCT and NSPS levels.

Toxic Pollutants

Analytical results for 36 toxic pollutants found in raw and treated wastewaters are summarized in Table VI-1 through VI-3. Twnety-three different toxic organic pollutants were identified as present and then quantified at the seven hot coating plants sampled for priority pollutants, although only about half that number were identified at any single plant. Twelve of the twenty-three organic pollutants were found at only one of the plants, generally at concentrations less than 0.01 mg/l. Nine of the twenty-three organic pollutants were found at levels in excess of 0.01 mg/l in either raw or treated hot coating wastewaters, but one of those, methylene chloride, is believed to be an artifact. In treated effluents, methylene chloride, chloroform, 1,1,1 trichloroethane and 4,6-dinitro-o-cresol were found in excess of 0.01 mg/l, with only methylene chloride exceeding 0.05 mg/l. Phthalates were also found universally where automatic samplers were used to collect samples, indicating a problem with leaching of plastic tubing plasticizers into the sample.

Of the 130 different pollutants listed as toxics, 35 (excluding methylene chloride) have been found to be present in measurable concentrations in raw wastewater or treated effluent from the seven plants surveyed during the toxic pollutant survey of this subcategory. Not all of the 35 pollutants are directly related to the plant operations. As many as 26 have been identified in the water used as makeup at the surveyed plants, although concentrations tend to be less than 10 micrograms per liter for most pollutants in the intake waters tested.

No definite source was ascribed to the toxic organic pollutants found in wastewaters from hot coating operations. Residual oils applied during cold rolling operations prior to coating is one possible source of low level contamination of coating wastewaters by so many different organics. Trichloroethylene, tetrachloroethylene, and 1,1,1 trichloroethane may be present in the degreasing solvent used as a cleaner prior to coating. Toxic metal pollutants are more directly related to the coating operations. Not only are certain toxic metals like zinc, cadmium, lead, and chromium used in the hot dipped coating processes, but most of the other toxic metals are also found as trace contaminants in the baths associated with hot coating. Chromium, copper, lead, nickel, and zinc were found in raw and treated wastewaters from all hot coating operations. Most concentrations were reduced to a considerable extent by treatment.

The wastewater treatment systems used at these hot coating plants were not designed to control and treat the toxic organic pollutants found in these wastewaters. However, most plants show some reduction in the quantity of these pollutants found in their wastewaters. Toxic organic pollutants in effluents were incidentally treated along with other pollutants to levels such that no specific organic removal step is practical other than recycle. Toxic metals were also removed to low levels through the use of precipitation, flocculation, and sedimentation (or filtration). As a result, the Agency believes that an acceptable control of the various toxic pollutants from hot coating operations can be achieved by establishing limitations for a relatively small number of indicator pollutants. For a summary of pollutants selected for limitation, refer to Table VI-4. As noted in the table, a common list of pollutants has been selected for all hot coating operations. The Agency believes that the limitations for these pollutants will result in the control of the other toxic pollutants found in these wastewaters. In addition the use of a common list of pollutants will faciliate co-treatment of wastewaters from the different hot coatings lines, as well as with compatible wastewaters from other subcategories.

At proposal of this regulation (46 FR 1858) the Agency considered establishing effluent limitations for cadmium for discharges from cadmium coating operations. The information provided by the industry in the DCPs indicate that there were two coating operations (Plants 0580G and 0792A) that used cadmium as a principal coating metal. Recent information received by the Agency indicate that Plant 0580G has been permanently retired. Plant 0792A has been shutdown. However, the cadmium coating line will be relocated at another existing plant site located in Pennsylvania. This plant has been retrofitted within the past three years with a BPT type wastewater treatment facility designed to remove toxic metals. Further, the Agency has learned that this cadmium coating line is an intermittent batch operation. Water is used in this operation to quench the wire product following coating. Discharge from this quench tank occurs infrequently. Due to the nature of this operation, and the fact that the Agency is unaware of any hot dip, cadmium coating line currently in operation, the Agency has decided not to promulgate nationally applicable effluent limitations and standards for cadmium coating operations. The Agency believes that, in this particular instance, effluent limitations and standards can be more effectively developed on a site specific basis by the permit writer.

Data are also available for a variety of nontoxic pollutants for which limitations are not being promulgated. These pollutants were measured to enable evaluation of factors such as scale formation and corrosion where recycle of wastewater is considered, and to aid in evaluation of chemical treatment costs and sludge loads. Additional measurements in hot coating operations included acidity/alkalinity, calcium, chloride, iron, solids (dissolved), and sulfate.

TABLE VI-1

TOXIC POLLUTANTS IN HOT COATING - GALVANIZING WASTEWATERS

(All concentrations in mg/l)

		0612 111		0396A 112		0948C 114		01121 116		0920E 118		0476A 119	
Toxic Organics		Raw	Trt.*	Raw	Trt.*	Raw	Trt.*	Raw	Trt.*	Raw	Trt.	Raw	Trt.*
1	Acenaphthene	ND	0.00	ND	0.00	ND	0.00	0.00	ND	ND	0.00	ND	<0.010
4	Benzene	ND	0.00	ND	0.00	ND	<0.010	0.00	ND	0.006	0.00	0.00	ND
11	1,1,1-Trichloroethane	0.067	ND	ND	ND	0.010	0.032	ND	ND	ND	ND	ND	0.00
21	2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	0.00	0.00	ND	ND	ND	<0.010	ND
23	Chloroform	0.015	0.00	<0.010	<0.010	<0.010	0.014	0.007	0.010	0.074	0.048	0.069	0.014
24	2-Chlorophenol	ND	ND	0.00	ND	ND	0.00	ND	ND	ND	0.00	<0.010	ND
26	1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	0.153	ND	ND	ND
31	2,4-Dichlorophenol	0.00	<0.010	ND	ND	0.00	ND	0.00	ND	ND	ND	ND	ND
39	Fluoranthene	ND	<0.010	0.019	0.010	<0.010	<0.010	0.00	0.00	ND	0.00	0.00	<0.010
44	Methylene chloride	0.115	0.016	0.013	0.008	0.016	0.230	0.018	0.006	ND	ND	<0.010	0.06
48	Dichlorobromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.010	ND
55	Naphthalene	ND	ND	ND	<0.010	ND	<0.010	ND	ND	ND	ND	ND	ND
60	4,6-Dinitro-o-cresol	ND	ND	ND	0.020	ND	ND	ND	ND	ND	0.00	ND	ND
64	Pentachlorophenol	ND	0.00	ND	ND	0.022	0.00	0.00	ND	ND	0.00	ND	ND
65	Phenol	ND	ND	ND	<0.010	ND	0.00	0.00	ND	ND	ND	ND	ND
73	Benzo(a)pyrene	ND	<0.010	ND	0.00	ND	0.00	ND	ND	ND	0.00	ND	ND
77	Acenaphthylene	ND	0.00	ND	<0.010	<0.010	<0.010	ND	ND	ND	0.00	ND	<0.010
80	Fluorene	0.00	ND	ND	0.00	ND	<0.010	<0.010	ND	ND	0.00	ND	<0.010
84	Pyrene	0.00	<0.010	0.016	ND	<0.010	<0.010	0.00	0.00	ND	0.00	0.00	<0.010
85	Tetrachloroethylene	0.009	ND	<0.010	ND	0.00	0.00	0.006	ND	0.008	0.005	ND	ND
86	Toluene	ND	ND	ND	0.00	0.00	<0.010	ND	ND	<0.010	<0.010	ND	ND
87	Trichloroethylene	0.046	<0.010	ND	ND	ND	ND	ND	ND	ND	0.00	ND	ND
Toxic Metals and Cyanide													
114	Antimony	NA	NA	NA	NA	NA	NA	NA	NA	0.005	0.001	NA	NA
115	Arsenic	NA	NA	0.04	<0.010	NA	<0.010	NA	NA	0.021	0.004	NA	NA
117	Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	<0.02	<0.02	NA	NA
118	Cadmium	<0.010	0.02	<0.020	<0.02	<0.02	<0.02	0.005	<0.010	<0.2	<0.2	<0.015	<0.015
119	Chromium	0.15	0.02	0.23	0.08	10.2	0.01	0.10	<0.03	2.93	0.20	<0.025	<0.025
120	Copper	0.06	0.03	2.5	0.17	0.01	<0.02	0.20	0.00	0.120	<0.04	0.0210	0.02
121	Cyanide	0.008	0.021	0.018	0.002	0.014	0.008	0.006	0.002	0.019	0.014	0.006	0.012
122	Lead	0.20	0.19	25	0.58	<0.05	<0.05	0.19	0.05	<0.06	<0.06	0.42	<0.10
124	Nickel	0.03	0.03	1.3	0.27	0.03	0.02	0.09	0.02	<0.50	2.58	<0.02	0.030
125	Selenium	NA	NA	<0.01	<0.010	NA	<0.010	NA	NA	0.008	0.012	NA	NA
126	Silver	<0.02	0.02	0.06	0.09	<0.02	<0.02	<0.02	<0.02	<0.25	<0.25	<0.02	<0.02
127	Thallium	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	<0.05	NA	NA
128	Zinc	3.2	0.13	50	0.25	0.65	0.07	15	0.13	82.0	6.7	2.8	0.06

---

*: Indicates water quality of central treatment effluent

NA: Not Analyzed
ND: None Detected

TABLE VI-2

TOXIC POLLUTANTS IN HOT COATING - TERNE COATING WASTEWATERS

(All concentrations in mg/l)

Toxic Organics	0856D 113 Raw
23 Chloroform	0.050
30 1,2-Trans-dichloroethylene	0.009
44 Methylene chloride	1.25
65 Phenol	0.008
85 Tetrachloroethylene	0.007
Toxic Metals and Cyanide	
114 Antimony	0.006
115 Arsenic	0.001
117 Beryllium	<0.008
118 Cadmium	<0.080
119 Chromium	2.675
120 Copper	0.040
121 Cyanide	0.003
122 Lead	0.030
124 Nickel	0.2
125 Selenium	<0.002
126 Silver	<0.10
127 Thallium	<0.050
128 Zinc	0.062

NOTE: Plant's wastewater treatment under construction at time of sampling. Raw wastewater sample was the only one available.

TABLE VI-3

TOXIC POLLUTANTS IN HOT COATING - ALUMINIZING WASTEWATERS

(All concentrations in mg/l)

	0112I 116	
Toxic Organics	**Raw**	**Treated***
23 Chloroform	<0.010	<0.010
44 Methylene Chloride	0.010	0.006
60 4,6-Dinitro-o-cresol	0.006	ND
Toxic Metals and Cyanide		
118 Cadmium	<0.010	<0.010
119 Chromium	0.10	<0.03
120 Copper	0.22	0.02
121 Cyanide	0.001	0.001
122 Lead	0.39	0.05
124 Nickel	0.18	0.015
126 Silver	<0.02	<0.02
128 Zinc	0.35	0.13

---

*: Indicates water quality of central treatment effluent
ND: Not detected

TABLE VI-4

SELECTED POLLUTANT PARAMETERS
HOT COATING OPERATIONS

	All Hot Coating Operations				
	BPT	BAT	PSES	NSPS	PSNS
Total Suspended Solids	X			X	
Oils and Greases	X			X	
pH, Units	X			X	
Chromium, Hexavalent(1)	X	X	X	X	X
Lead, Total	X	X	X	X	X
Zinc, Total	X	X	X	X	X

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(1) Limitation only applies to operations which discharge wastewaters from a chromate rinsing step.

X: Selected pollutant parameter subject to limitation or regulation.

HOT COATING SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

In developing the alternative treatment systems, limitations and incremental costs, the Agency considered the level of existing wastewater treatment at most plants. The alternative treatment systems were then formulated in an "add-on" fashion to these basic levels. This section summarizes treatment practices currently in use in the industry. Descriptions of plants sampled by the Agency and the respective effluent data are also presented. In addition, the impact of make-up water quality on raw wastewater pollutant loadings is assessed.

Summary of Treatment Practices Currently Employed for Hot Coating Operations

As noted previously, the process wastewaters generated during hot coating operations include fume scrubbing wastewaters, and chemical treatment solutions and rinses. Wastewaters are often treated in central treatment systems along with wastewaters from other forming and finishing operations. DCP data indicate that more than 75% of all hot coating wastewaters are treated jointly with wastewaters from pickling, cold rolling, hot forming, and other finishing operations. Most of the remaining 25%, are providing some degree of separate treatment prior to central treatment.

The more common hot coating treatment practices are listed below:

1. No matter what wastewater treatment technique is used, an important first step is to minimize the quantity of wastewaters requiring treatment. This is accomplished by providing dragout recovery tanks downstream of the main coating tanks; by reusing or recycling the rinsewaters and fume scrubber wastewaters; by employing high pressure spray rinses with recycling or reuse of rinsewaters; and by attention to maintenance of equipment such as rolls and squeegees designed to reduce solution losses. At some hot coating lines with slower line speeds, carryover of wastewaters is minimized to the point that only low levels of pollutants are discharged.

   Cascade rinse systems are effective methods for minimizing wastewater volumes.

2. The first treatment step for hot coating wastewaters is usually the blending of these wastewaters with alkaline wastewaters, to precipitate the dissolved metals. This blending of wastewaters is practiced at several hot coating plants.

3. Improved treatment effectiveness is attained through controlled neutralization/precipitation of these wastewaters using an alkaline material such as lime or caustic soda. Use of these products achieves higher pH levels than is normally possible through simply blending with alkaline wastewaters. Polymers are also used to enhance settling. Flocculator-clarifiers are installed at these treatment facilities to remove the large quantities of metal hydroxide precipitates. Sludges are sometimes dewatered using vacuum filters and are then transferred to landfill areas. Wet sludges are landfilled or lagooned at many hot coating operations.

4. Other treatment methods depend upon the source of the wastewaters. These are tailored to specific needs, for example:

   Reduction of Hexavalent Chromium - Galvanizing and other metallic coating operations which produce wastewaters contaminated with chromate or dichromate ions have separate pretreatment stages which are designed to reduce toxic hexavalent chromium to trivalent chromium prior to neutralization. Most often, pickling rinse solutions or spent pickle liquors are blended with the chromium wastewaters to acidify the wastewaters and provide the required reductant. In some cases, additional reducing agents such as bisulphites or sulfur dioxide gases are used in place of, or in addition to, pickling wastes. Wastewaters containing the reduced chromium are then discharged to a neutralization stage, where the addition of lime or caustic soda precipitates the chromium as hydroxide. Alternatively, the chromates may be precipitated out of solution by the addition of barium salts, such as sulfates or carbonates. A precipitate of barium chromate can be separated out for subsequent recovery of barium and chromium. Also, ion exchange techniques have been used at several coating lines to recover clean chromic acid from strong solutions contaminated by iron and trivalent chromium. The recovered acid is reused in the coating or chemical treatment operations.

   Precipitation of Aluminum, Cadmium, Copper, Lead, Tin, and Other Metals - As described previously in Section VI, the sources of these toxic metal pollutants in hot coating operations are from rinsing or quenching of the product after the coatings have been applied; and, in the disposal of spent coatings solutions.

   Hydrated lime or caustic soda is used to raise the pH of the wastewaters. At the elevated pH, metal hydroxides are precipitated and are removed by sedimentation. This treatment sequence is very common in this industry. An alternate heavy metal precipitation step has been used in the metal finishing industry, and the Agency considers it to be applicable to similar wastewaters from coating operations. The treatment procedure involves the addition of soluble sulfides (such as sodium sulfide or sodium hydrosulfide) or a ferrous sulfide slurry to form insoluble metal sulfides which can be separated prior to discharge. Metal sulfides have lower solubilities than metal hydroxides. However, data from pilot studies conducted on steelmaking wastewaters indicate that precipitation with sulfides does not result in substantially greater removal of toxic metals.

Ferrous iron is also present in hot coating wastewaters. Aeration, with subsequent neutralization is currently the most widely used method for treating ferrous iron. This is usually done in a rapid mixing tank where the pH of the wastewater is adjusted to 8.5 with lime. The neutralized wastewater is then pumped to a clarifier, thickener or settling lagoon, where the precipitated iron in the hydroxide form settles out along with other metal hydroxide precipitates. In a properly designed and operated treatment plant, the dissolved iron in the discharge from the sedimentation unit should be significantly less than 1 mg/l.

Oil and Grease - The removal of oil and grease from wastewaters can be effected by the following techniques used either alone or in combination depending on the nature of the wastewater.

Gravity Separation - With the exception of filtration, free oil removal processes are based on density separation. The wastewaters are treated in a settling basin or clarifier where the free oils are floated to the surface and removed with skimmers. The heavier oil-coated particles settle to the bottom. Many hot coating wastewater treatment plants include surface skimmers to remove floating oil.

Suspended Solids - Suspended solids in the hot coating subcategory for the most part consist of metals removed during rinsing, and metal hydroxides generated during lime neutralization of these wastewaters. Suspended solids are usually treated by gravity separation. Most plants use clarifiers or thickeners, supplemented with the addition of appropriate organic flocculant aids. Suspended solids are also removed at some plants by filtration.

5. Co-treatment of wastewaters from many different sources into one central treatment system are commonly practiced in the industry. In these systems, wastewaters from hot coating lines usually represent a minor portion of the total flow, notably when hot forming wastewaters are present. Such terminal treatment systems may incorporate any or all of the individual treatment stages mentioned above prior to mixing with other wastewaters. At some plants all wastewaters are combined before treatment commences. This results in dilution of the wastes and reduces the effectiveness of subsequent treatment. The only way to be certain that such loads are reduced is to provide pretreatment prior to mixing with other incompatible wastewaters.

Plant Visits

Visits were made to eleven plants to study the individual operations included in the hot coating subcategory. The standard abbreviations and symbols used for the control and treatment technologies are listed in Table VII-1. Tables VII-2 through VII-4 present the treated effluent waste loads from these plants.

Plant I-2 (0856P) - Figure VII-1

Wire galvanizing wastewaters are diluted and treated by reaction with other mill wastewaters in a terminal lagoon, with subsequent discharge to a receiving stream.

Plant V-2 (0936) - Figure VII-2

Wastewaters from wire hot coating and pickling are combined and neutralized with caustic soda prior to discharge to a POTW.

Plant MM-2 (0856F) - Figure VII-3

Hot and cold strip/sheet coating wastewaters are combined with wastewaters from other sources. Treatment includes equalization, oil separation, aeration, sedimentation, lagooning, and recirculation to service water with intermittent blowdown to the river.

Plant NN-2 (0920E) - Figure VII-4

This plant uses equalization, mixing, two-stage lime addition, polymer feed, and clarification for treatment of batch and continuous galvanizing wastewaters from strip, sheet and miscellaneous shape production lines. Clarifier underflows are vacuum filtered then disposed of in a landfill. Overflows are discharged to a receiving stream.

Plant OO-2 (0060) - Figure VII-5

At this plant, mixing and dilution of rinsewaters from terne coating of strip/sheet prior to discharge is practiced. Solution dragout is minimized through strict attention to maintenance of equipment.

Plant PP-2 (0856D) - Figure VII-6

See Plant 00-2 (0060).

Plant 111 (0612) - Figure VII-7

Wiper waters from wire galvanizing operations are collected, recycled via hot rolling mills, with a small continuous bleed-off to treatment. Pickling rinses and spent HCl concentrates are combined with wastewaters from nail and fence galvanizing; treated with lime; aeration; clarification; and, pressure filtration through sand prior to discharge.

Plant 112 (0396D) - Figure VII-8

Wastewaters from continuous galvanizing are combined with pickling concentrates and rinses, treated with lime and polymer, clarified, and discharged to a POTW.

Plant 113 (0856D) - Figure VII-9

During the toxic survey (March, 1977), wastewaters from this continuous strip/sheet terne coating line were discharged without treatment. A combined chemical treatment plant is under construction. Meanwhile, solution dragout is minimized through strict attention to maintenance of equipment.

Plant 114 (0948C) - Figure VII-10

Galvanizing wastewaters from continuous strip/sheet coating lines are blended with wastewaters from pickling, cold rolling, and electrolytic coating lines; equalized; treated with lime; settled; skimmed free of oils; treated with polymer; clarified; and, discharged.

Plant 116 (0112I) - Figure VII-11

Wastewaters from galvanizing, aluminizing, electrolytic coating, and alkaline degreasing of wire, fasteners, and special shapes, are combined; treated with lime and polymer; clarified; filtered; and, stored in a large lagoon for reuse or discharge.

Plant 118 (0920E) - Figure VII-12

Spent galvanizing solutions, rinsewater, fume scrubber water and some noncontact cooling water from continuous strip/sheet and batch miscellaneous shape coating lines; are blended; treated with lime in two stages; fed polymer; clarified; and discharged. Clarifier underflows are vacuum filtered.

Plant 119 (0476A) - Figure VII-13

Wastewaters from pipe and tube pickling and galvanizing are combined with wastewaters from other plant sources; equalized; skimmed free of oil; aerated; treated with lime and polymer; clarified; and, discharged.

Effect of Make-up Water Quality

Where the mass loading of a limited pollutant in the make-up water to a process is small in relation to the raw waste loading of that pollutant, the impact of make-up water quality on wastewater treatment system performance is not significant, and, in many cases, not measurable. In these instances, the Agency has determined that the respective effluent limitations and standards should be developed and applied on a gross basis.

As shown in Tables VII-5 to VII-7, the impact of make-up water quality on raw wastewater pollutant loadings for the sampled hot coating operations is not significant for any of the toxic metal pollutants. The suspended solids levels in make-up waters for galvanizing and terne operations were found to be significant when compared to raw waste loadings at the sampled plants (39% and 34%, respectively). However, the model treatment technology includes lime or caustic precipitation which will result in the formation of metal hydroxide precipitates. The suspended solids concentrations after lime or caustic addition are significantly higher than raw waste concentrations; and the removal of the hydroxide floc will also result in removal of suspended solids contained in make-up waters. Thus, the Agency concludes that the impact of make-up water quality on raw waste loadings for hot coating operations are not significant, and the limitations and standards should be applied on a gross basis, except to the extent provided by 40 CFR §122.63(h).

TABLE VII-1

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. **Operating Modes**

1. OT Once-Through

2. Rt,s,n Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn Blowdown, where n = discharge as % of raw waste flow

B. **Control Technology**

10. DI Deionization

11. SR Spray/Fog Rinse

12. CC Countercurrent Rinse

13. DR Drag-out Recovery

C. **Disposal Methods**

20. H Haul Off-Site

21. DW Deep Well Injection

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 2

C. Disposal Methods (cont.)

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. Treatment Technology

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

D. Treatment Technology (cont.)

43. FLt — Flocculation, where t = type

t: L = Lime
A = Alum
P = Polymer
M = Magnetic
O = Other, footnote

44. CY — Cyclone/Centrifuge/Classifier

44a. DT — Drag Tank

45. CL — Clarifier

46. T — Thickener

47. TP — Tube/Plate Settler

48. SLn — Settling Lagoon, where n = days of retention time

49. BL — Bottom Liner

50. VF — Vacuum Filtration (of e.g., CL, T> or TP underflows)

51. Ft,m,h — Filtration, where t = type
m = media
h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52. CLt — Chlorination, where t = type

t: A = Alkaline
B = Breakpoint

53. CO — Chemical Oxidation (other than CLA or CLB)

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 4

D. Treatment Technology (cont.)

54. BOt Biological Oxidation, where t = type

t: An = Activated Sludge
n = No. of Stages
T = Trickling Filter
B = Biodisc
O = Other, footnote

55. CR Chemical Reduction (e.g., chromium)

56. DP Dephenolizer

57. ASt Ammonia Stripping, where t = type

t: F = Free
L = Lime
C = Caustic

58. APt Ammonia Product, where t = type

t: S = Sulfate
N = Nitric Acid
A = Anhydrous
P = Phosphate
H = Hydroxide
O = Other, footnote

59. DSt Desulfurization, where t = type

t: Q = Qualifying
N = Nonqualifying

60. CT Cooling Tower

61. AR Acid Regeneration

62. AU Acid Recovery and Reuse

63. ACt Activated Carbon, where t = type

t: P = Powdered
G = Granular

64. IX Ion Exchange

65. RO Reverse Osmosis

66. D Distillation

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. Treatment Technology (cont.)

67.	AA1	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide

TABLE VII-2

EFFLUENT WASTE LOADS - HOT COATING - GALVANIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

A. Toxic Pollutant Survey

	Plant Codes	0612		0396A		0948C		0112I		0920E		0476A	
	Sample Points	111 (J/B+C+D+E)H		112 (D/B+E+D+J)H		114 (B/G)H		116 (D/F+B)H		118 D		119 (D/E)G	
	Flow, gal/ton	1414		287		211		592		1177		147	
	C&TT	NL,CL,FDSP		AE,NL,FLP,CL,VF,POTW		NL,FLP,T,SS		NL,FLP,T,FDSP		NL,FLP,T,VF		SS,NL,FLP,CL,VF	
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Suspended Solids	11	0.00519	43	0.000491	6	0.00184	<1	<0.00160	37	0.182	4	0.000051
	Oils and Greases	4	0.0485	6	0.000066	6	0.00665	4	0.00252	5	0.0245	11	0.00120
	Chromium +6	0.002	0.000010	NA	NA	0.001	0.0000	0.003	0.000006	0.077	0.000378	0.004	0.000002
	pH, Units	8.3-8.5	-	8.6-9.5	-	7.6-7.8	-	7.3-7.7	-	8.7-9.0	-	6.6-9.0	-
4	Benzene	0.00	0.0000	0.00	0.00	<0.010	0.0000	ND	ND	0.00	0.0000	ND	ND
11	1,1,1-Trichloroethane	ND	ND	ND	ND	0.032	0.0000	ND	ND	ND	ND	0.00	0.0000
23	Chloroform	0.00	0.0000	<0.010	0.0000	0.014	0.0000	<0.010	0.0000	0.048	0.000236	0.014	0.000021
26	1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
39	Fluoranthene	<0.010	0.0000	<0.010	<0.000002	<0.010	0.0000	0.00	0.0000	0.00	0.0000	<0.010	0.0000
44	Methylene Chloride*	0.016	0.00128	0.008	0.000038	0.230	0.000015	0.006	0.000047	NA	NA	0.006	0.0000
64	Pentachlorophenol	0.00	0.0000	ND	ND	0.00	0.0000	ND	ND	0.00	0.0000	ND	ND
66	Bis(2-ethylhexyl)phthalate*	0.130	0.000958	0.105	0.000004	0.062	0.000004	<0.010	<0.000002	0.005	0.000025	0.150	0.000033
67	Butylbenzyl phthalate*	ND	ND	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.003	0.000015	ND	ND
68	Di-n-butyl phthalate*	0.013	0.0000	<0.010	<0.000002	<0.010	<0.000001	<0.010	<0.000003	0.00	0.0000	0.013	0.0000
69	Di-n-octyl phthalate*	ND	ND	ND	ND	ND	ND	ND	ND	0.00	0.0000	ND	ND
70	Diethyl phthalate*	<0.010	0.0000	0.00	0.0000	<0.010	0.0000	0.00	0.0000	ND	ND	ND	ND
71	Dimethyl phthalate*	0.00	0.0000	0.007	0.000001	<0.010	<0.000001	ND	ND	0.00	0.0000	<0.010	0.0000
85	Tetrachloroethylene	ND	ND	ND	ND	0.00	0.00000	ND	ND	0.005	0.000025	ND	ND
87	Trichloroethylene	<0.010	<0.000092	ND	ND	ND	ND	ND	ND	0.00	0.0000	ND	ND
115	Arsenic	NA	NA	<0.01	<0.000003	NA	NA	NA	NA	0.004	0.000024	NA	NA
119	Chromium	0.02	0.000001	0.08	0.000011	0.01	0.000064	<0.03	<0.000373	0.09	0.000442	<0.03	0.0000
120	Copper	0.03	0.000020	0.17	0.000128	<0.02	<0.00001	0.01	0.000047	<0.04	<0.000196	0.02	0.000001
121	Cyanide	0.021	0.000021	0.002	0.000004	0.007	0.000006	0.002	0.000003	0.014	0.000069	0.012	0.000002
122	Lead	0.19	0.0000010	0.57	0.000658	<0.05	<0.000044	0.05	0.000182	<0.60	<0.00295	<0.10	<0.000124
124	Nickel	0.03	0.000011	0.27	0.000186	0.02	0.000009	0.02	0.000099	2.58	0.0127	0.03	0.0000
126	Silver	0.02	0.0000	0.09	0.000001	<0.02	0.0000	<0.02	<0.000323	<0.25	<0.00123	<0.021	<0.000012
128	Zinc	0.12	0.000009	0.24	0.000270	0.07	0.000222	0.13	0.000476	6.73	0.0330	0.06	0.000022

TABLE VII-2
EFFLUENT WASTE LOADS - HOT COATING - GALVANIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
PAGE 2

B. Original Guidelines Survey

Plant Codes	0856P		0936		0856F		0920E	
	I-2		V-2		MM-2		NN-2	
Sample Points	5		4		6		4	
Flow, gal/ton	220		1655		699		1233	
C&TT	SL		NC;POTW		CR,NL,FLP,CL,SS		NL,FLP,T,VF	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	39	0.0358	276	1.91	60	0.175	4	0.0206
Oils and Greases	14	0.0128	9.3	0.0642	22.5	0.0656	9.7	0.0499
Chromium +6	NA	NA	NA	NA	0.004	0.000012	0.012	0.000062
pH, Units	6.7	-	2.5	-	4.1-11.5		7.9	-
119 Chromium	NA	NA	NA	NA	0.86	0.00251	0.026	0.000134
120 Copper	NA	NA	NA	NA	0.023	0.000067	0.007	0.000036
121 Cyanide	NA	NA	NA	NA	0.018	0.000052	0.017	0.000087
122 Lead	NA	NA	11.0	0.0759	0.05	0.00015	0.018	0.000093
124 Nickel	NA	NA	NA	NA	0.033	0.000096	<0.02	<0.000103
128 Zinc	NA	NA	NA	NA	0.035	0.000102	1.36	0.00699

ND: None detected.
NA: Not analyzed.
* : Artifacts not originally present in wastewater.

TABLE VII-3

EFFLUENT WASTE LOADS - HOT COATING - TERNE
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

	Toxic Pollutant Survey		Original Guidelines Survey			
Plant Code	0856D(1)		0060(2)		0856D(1)	
	113		00-2		PP-2	
Sample Points	C		4		2	
Flow, gal/ton	1006(3)		517		2194(3)	
C&TT	Under Construction		None		None	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	11	0.0461	50	0.108	8	0.0732
Oil and Grease	4	0.0168	3	0.00647	4.3	0.0393
Hexavalent Chromium	0.002	0.000008	<0.002	<0.000004	0.0026	0.000024
Tin	<0.04	<0.000168	<2	<0.00431	<2	<0.0183
pH, units	5.2-6.5	-	2.2-4.1	-	3.6-5.2	-
115 Arsenic	0.001	0.000004	NA	NA	NA	NA
119 Chromium	2.68	0.0112	0.01	0.000022	0.099	0.000906
120 Copper	0.04	0.000168	0.03	0.000065	<0.02	<0.000183
121 Cyanide	0.003	0.000013	0.010	0.000022	0.005	0.000046
122 Lead	0.05	0.000210	0.25	0.000539	0.02	0.000183
123 Mercury	0.00	0.0000	0.0002	0.0000	0.0003	0.000003
124 Nickel	0.20	0.000839	0.06	0.000129	0.027	0.000247
126 Silver	<0.025	<0.000105	NA	NA	NA	NA
128 Zinc	0.062	0.000260	1.05	0.00226	0.131	0.00120
Dissolved Iron	7.6	0.0319	74.3	0.160	14.9	0.136

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(1) Plant visited during both surveys
(2) Data covers two Terne Coating operations
(3) Includes non-contact cooling water

NA: Not Analyzed

TABLE VII-4

EFFLUENT WASTE LOADS - HOT COATING - ALUMINIZING SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

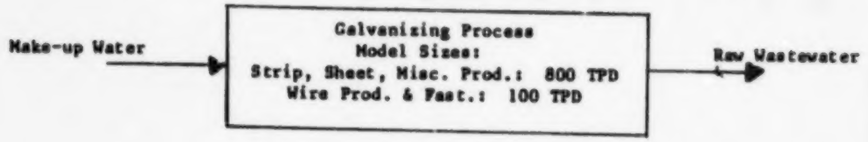
Toxic Pollutant Survey

Plant Codes	0112I 116
Sample Point	(E/(F+B))H
Flow, gal/ton	3960
C&TT	NL,FLP,CL,FDSP

	mg/l	lbs/1000 lbs
Suspended Solids	<1	<0.0330
Oils and Grease	4	0.0196
Hexavalent Chromium	0.003	0.000038
pH, units	7.3 - 7.7	-
118 Cadmium	<0.01	<0.000165
119 Chromium	<0.03	<0.000067
120 Copper	0.01	0.000357
121 Cyanide	0.002	0.000006
122 Lead	0.05	0.00245
124 Nickel	0.02	0.00130
126 Silver	<0.02	<0.000324
128 Zinc	0.13	0.000073
Dissolved Iron	0.04	0.000818

TABLE VII-5

NET CONCENTRATION AND LOAD ANALYSIS
HOT COATING - GALVANIZING OPERATIONS


Make-up Water
Galvanizing Process
Model Sizes:
Strip, Sheet, Misc. Prod.: 800 TPD
Wire Prod. & Fast.: 100 TPD
Raw Wastewater

Strip Sheet & Misc. Products:

No Fume Scrubbers 600 GPT x 800 TPD = 0.48 MGD
With Fume Scrubbers 654 GPT x 800 TPD = 0.52 MGD

Wire Products & Fasteners:

No Fume Scrubbers 2,400 GPT x 100 TPD = 0.24 MGD
With Fume Scrubbers 2,832 GPT x 100 TPD = 0.28 MGD

Strip, Sheet & Misc. Products:

No Fume Scrubbers 600 GPT x 800 TPD = 0.48 MGD
With Fume Scrubbers 960 GPT x 800 TPD = 0.77 MGD

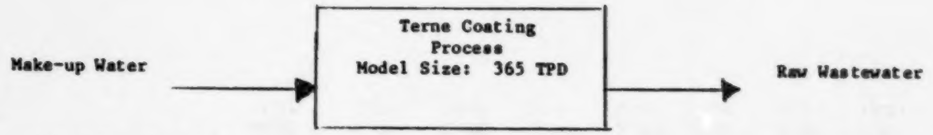
Wire Products & Fasteners:

No Fume Scrubbers 2,400 GPT x 100 TPD = 0.24 MGD
With Fume Scrubbers 5,280 GPT x 100 TPD = 0.53 MGD

	Make-up					Raw Waste				Make-up as a % of Raw Waste Load	
	Conc. (mg/l)			Avg. Load (lbs/day)		Avg. Conc. (mg/l)		Avg. Load (lbs/day)			
Regulated Pollutants	Min.	Max.	Avg.	SSM	WPF	SSM	WPF	SSM	WPF	SSM	WPF
Hexavalent Chromium	<0.002	0.015	0.003	0.012	0.006	0.84	0.15	4.14	0.46	0.29	1.30
Oil & Grease	1.0	8.0	4.0	16.52	8.58	54	20	266.1	60.99	6.21	14.07
Total Suspended Solids	<1.0	196	37	152.8	79.41	112	66	551.9	201.3	27.69	39.45
122 Lead	<0.050	0.080	0.007	0.029	0.015	0.52	1.5	2.56	4.57	1.13	0.33
128 Zinc	0.020	0.25	0.093	0.38	0.20	104	7.6	512.5	23.18	0.074	0.86

TABLE VII-6

NET CONCENTRATION AND LOAD ANALYSIS
HOT COATING - TERNE OPERATIONS


Make-up Water
Terne Coating
Process
Model Size: 365 TPD
Raw Wastewater

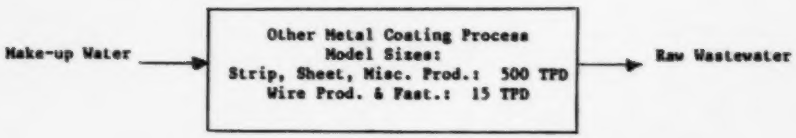
No Fume Scrubbers 600 GPT x 365 TPD = 0.22 MGD
With Fume Scrubbers 600 GPT x 365 TPD = 0.24 MGD

No Fume Scrubbers 600 GPT x 365 TPD = 0.22 MGD
With Fume Scrubbers 995 GPT x 365 TPD = 0.36 MGD

Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	<1.0	6.0	4.0	7.74	24	60.85	12.72
Total Suspended Solids	17	36	27	52.24	60	152.1	34.34
122 Lead	<0.05	<0.05	<0.05	0.00	0.95	2.41	0.00
128 Zinc	0.068	0.075	0.071	0.14	1.2	3.04	4.60

TABLE VII-7

NET CONCENTRATION AND LOAD ANALYSIS
HOT COATING - OTHER METAL COATING OPERATIONS


Make-up Water
Other Metal Coating Process
Model Sizes:
Strip, Sheet, Misc. Prod.: 500 TPD
Wire Prod. & Fast.: 15 TPD
Raw Wastewater

Strip Sheet & Misc. Products:

No Fume Scrubbers 600 GPT x 500 TPD = 0.30 MGD
With Fume Scrubbers 643 GPT x 500 TPD = 0.32 MGD

Wire Products & Fasteners:

No Fume Scrubbers 2,400 GPT x 15 TPD = 36,000 MGD
With Fume Scrubbers 3,840 GPT x 15 TPD = 57,600 MGD

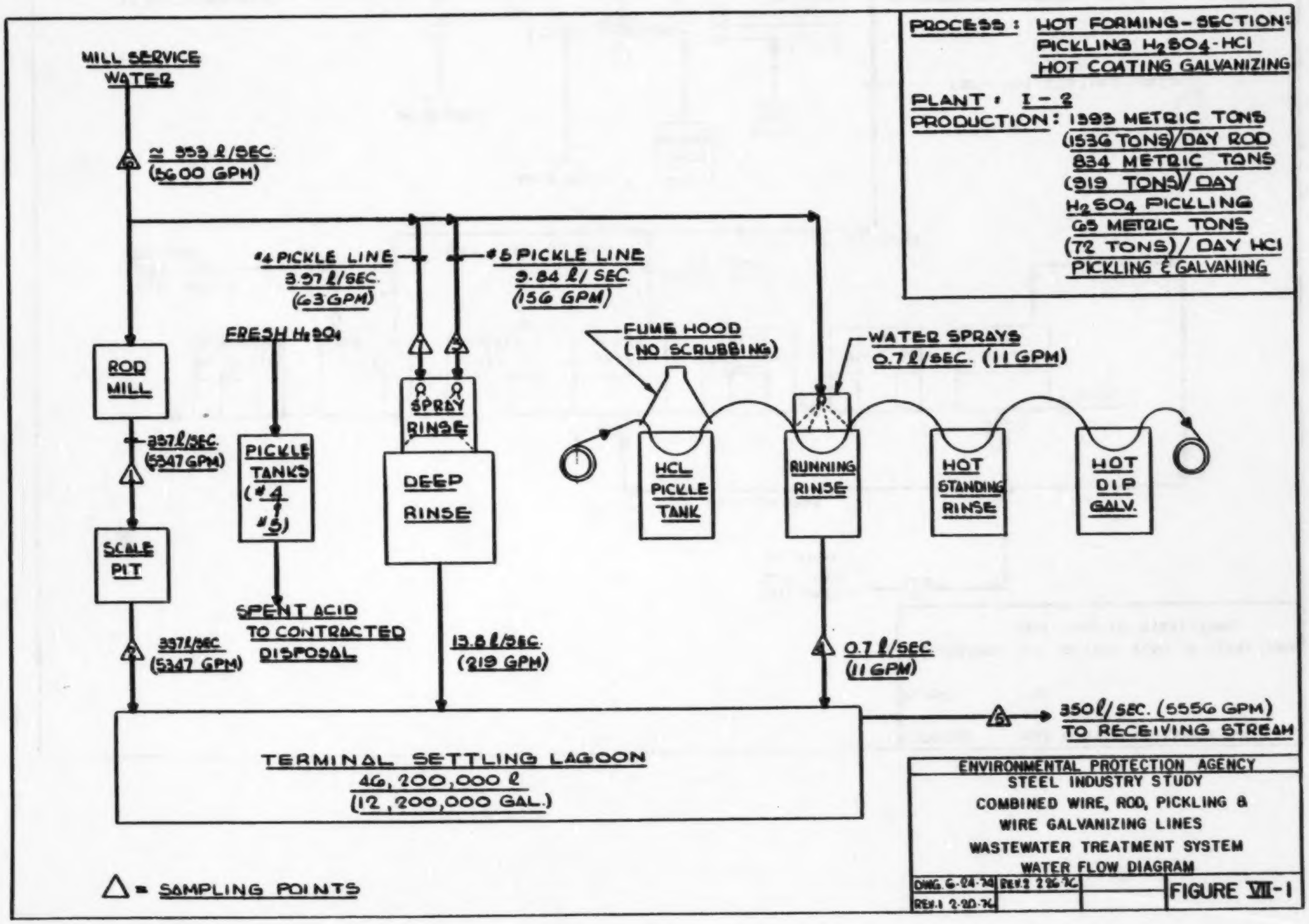
Strip, Sheet & Misc. Products:

No Fume Scrubbers 600 GPT x 500 TPD = 0.30 MGD
With Fume Scrubbers 888 GPT x 500 TPD = 0.44 MGD

Wire Products & Fasteners:

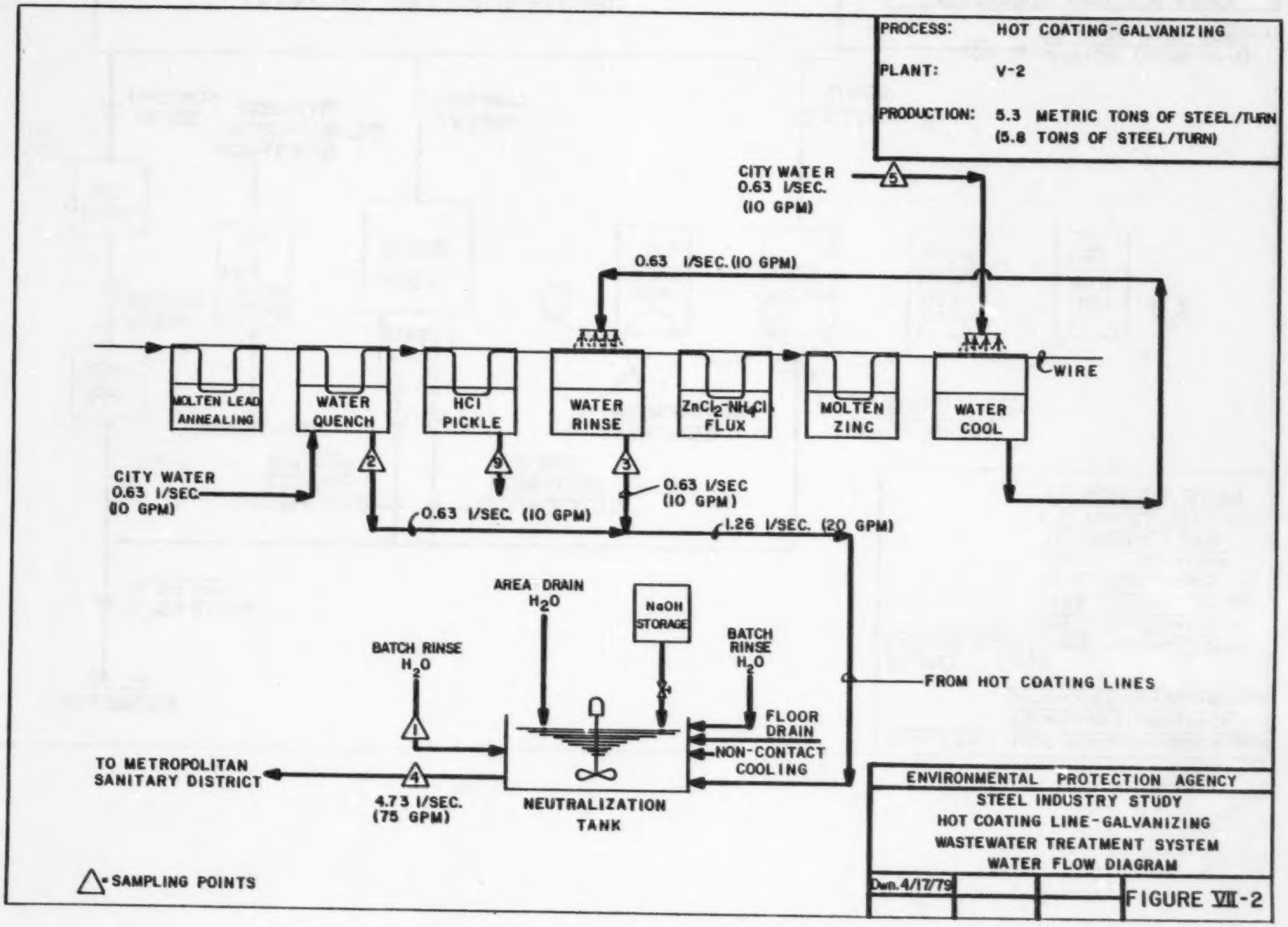
No Fume Scrubbers 2,400 GPT x 15 TPD = 36,000 MGD
With Fume Scrubbers 12,000 GPT x 15 TPD = 180,000 MGD

	Make-up					Raw Waste				Make-up as a % of Raw Waste Load	
	Concentration (mg/l)			Avg. Load (lbs/day)		Avg. Conc. (mg/l)		Avg. Load (lbs/day)			
Regulated Pollutants	Min.	Max.	Avg.	SSM	WPF	SSM	WPF	SSM	WPF	SSM	WPF
Oil & Grease	1.0	8.0	4.0	10.01	1.20	60	30	150.1	9.01	6.67	13.32
Total Suspended Solids	<1.0	196	35	87.57	10.51	400	250	1,001	75.06	8.75	14.00
122 Lead	<0.05	0.08	0.006	0.015	0.002	2.0	0.60	5.00	0.18	0.003	1.11
128 Zinc	0.02	0.14	0.084	0.21	0.025	5.0	1.0	12.51	0.30	1.68	8.33


PROCESS: HOT FORMING - SECTION: PICKLING H_2SO_4-HCl HOT COATING GALVANIZING
PLANT: I - 2
PRODUCTION: 1393 METRIC TONS (1536 TONS)/DAY ROD 834 METRIC TONS (919 TONS)/DAY H_2SO_4 PICKLING 65 METRIC TONS (72 TONS)/DAY HCl PICKLING & GALVANING
MILL SERVICE WATER
≃ 353 ℓ/SEC. (5600 GPM)
ROD MILL
337 ℓ/SEC. (5347 GPM)
SCALE PIT
337 ℓ/SEC (5347 GPM)
FRESH H_2SO_4
PICKLE TANKS (#4 & #5)
SPENT ACID TO CONTRACTED DISPOSAL
#4 PICKLE LINE 3.97 ℓ/SEC. (63 GPM)
#5 PICKLE LINE 9.84 ℓ/SEC. (156 GPM)
SPRAY RINSE
DEEP RINSE
13.8 ℓ/SEC. (219 GPM)
FUME HOOD (NO SCRUBBING)
WATER SPRAYS 0.7 ℓ/SEC. (11 GPM)
HCL PICKLE TANK
RUNNING RINSE
HOT STANDING RINSE
HOT DIP GALV.
0.7 ℓ/SEC (11 GPM)
TERMINAL SETTLING LAGOON 46,200,000 ℓ (12,200,000 GAL.)
350 ℓ/SEC. (5556 GPM) TO RECEIVING STREAM
△ = SAMPLING POINTS
DWG. 6-24-74
REV.1 2-20-76
REV.2 2-26-76

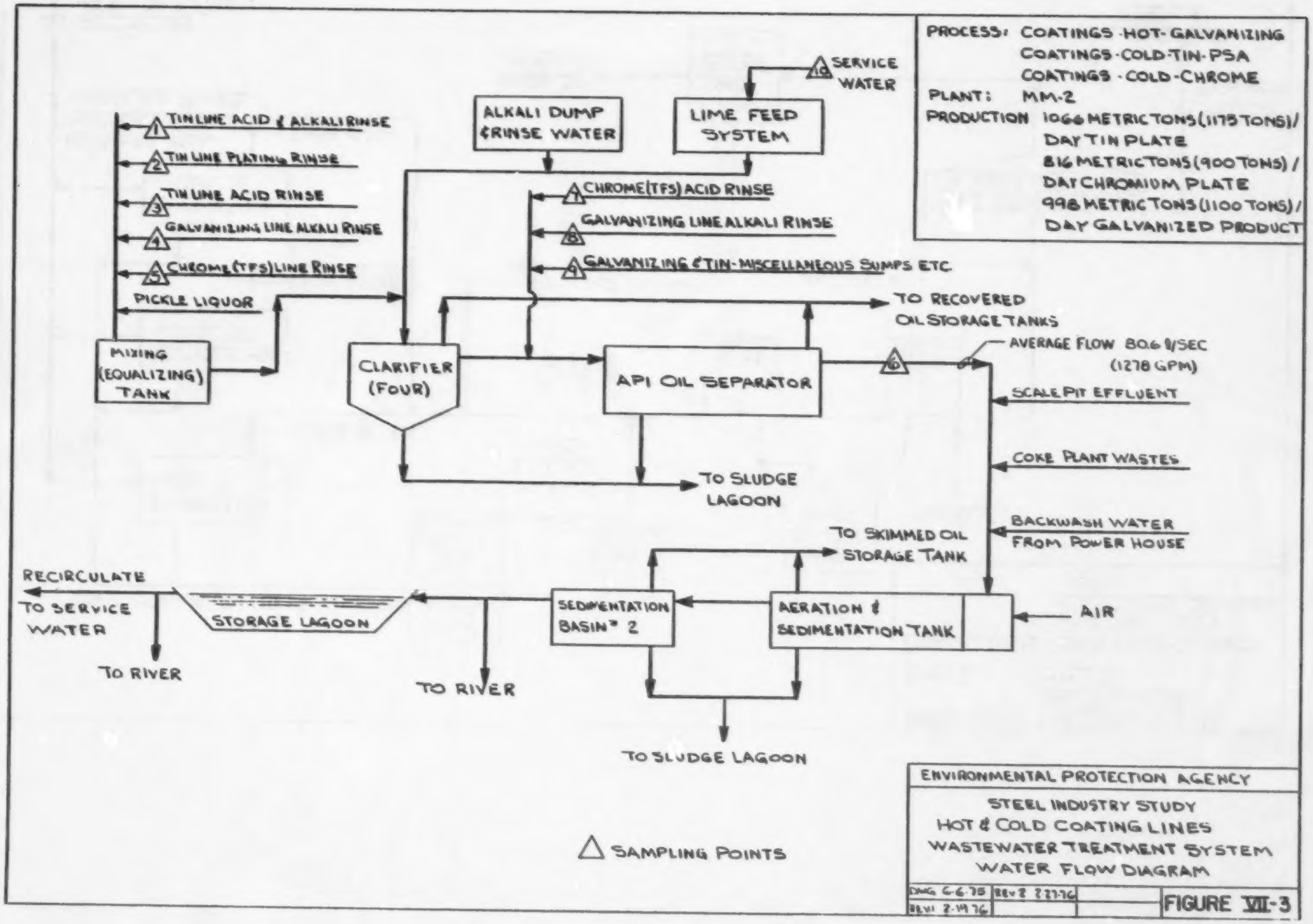
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COMBINED WIRE, ROD, PICKLING & WIRE GALVANIZING LINES
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-1


PROCESS: HOT COATING-GALVANIZING
PLANT: V-2
PRODUCTION: 5.3 METRIC TONS OF STEEL/TURN
(5.8 TONS OF STEEL/TURN)
CITY WATER
0.63 l/SEC.
(10 GPM)
5
0.63 l/SEC. (10 GPM)
MOLTEN LEAD ANNEALING
WATER QUENCH
HCl PICKLE
WATER RINSE
$ZnCl_2$-NH_4Cl FLUX
MOLTEN ZINC
WATER COOL
WIRE
CITY WATER
0.63 l/SEC.
(10 GPM)
2
6
3
0.63 l/SEC
(10 GPM)
0.63 l/SEC. (10 GPM)
1.26 l/SEC. (20 GPM)
AREA DRAIN
H_2O
NaOH STORAGE
BATCH RINSE
H_2O
BATCH RINSE
H_2O
FROM HOT COATING LINES
1
FLOOR DRAIN
NON-CONTACT COOLING
TO METROPOLITAN SANITARY DISTRICT
4
4.73 l/SEC.
(75 GPM)
NEUTRALIZATION TANK
△ = SAMPLING POINTS
Dwn. 4/17/79

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATING LINE-GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

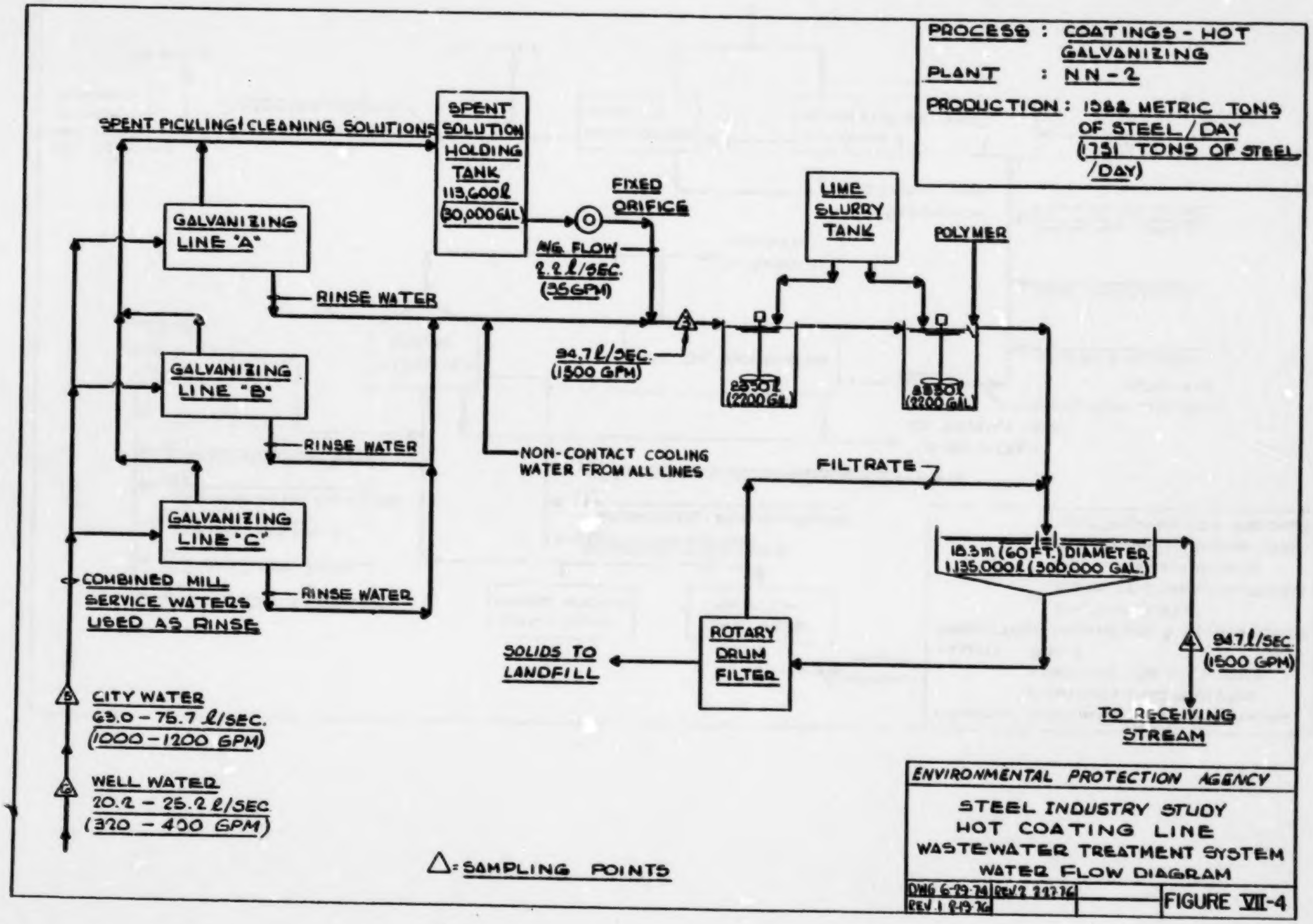
FIGURE VII-2


PROCESS: COATINGS-HOT-GALVANIZING
COATINGS-COLD-TIN-PSA
COATINGS-COLD-CHROME
PLANT: MM-2
PRODUCTION 1066 METRIC TONS (1175 TONS)/DAY TIN PLATE
816 METRIC TONS (900 TONS)/DAY CHROMIUM PLATE
998 METRIC TONS (1100 TONS)/DAY GALVANIZED PRODUCT
1 TIN LINE ACID & ALKALI RINSE
2 TIN LINE PLATING RINSE
3 TIN LINE ACID RINSE
4 GALVANIZING LINE ALKALI RINSE
5 CHROME (TFS) LINE RINSE
PICKLE LIQUOR
MIXING (EQUALIZING) TANK
ALKALI DUMP & RINSE WATER
LIME FEED SYSTEM
10 SERVICE WATER
7 CHROME (TFS) ACID RINSE
8 GALVANIZING LINE ALKALI RINSE
9 GALVANIZING & TIN-MISCELLANEOUS SUMPS ETC.
TO RECOVERED OIL STORAGE TANKS
CLARIFIER (FOUR)
API OIL SEPARATOR
6
AVERAGE FLOW 80.6 l/SEC (1278 GPM)
SCALE PIT EFFLUENT
COKE PLANT WASTES
TO SLUDGE LAGOON
BACKWASH WATER FROM POWER HOUSE
TO SKIMMED OIL STORAGE TANK
RECIRCULATE TO SERVICE WATER
STORAGE LAGOON
SEDIMENTATION BASIN # 2
AERATION & SEDIMENTATION TANK
AIR
TO RIVER
TO RIVER
TO SLUDGE LAGOON
△ SAMPLING POINTS
DWG 6-6-75
REV 1 2-19-76
REV 2 2-27-76

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT & COLD COATING LINES
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

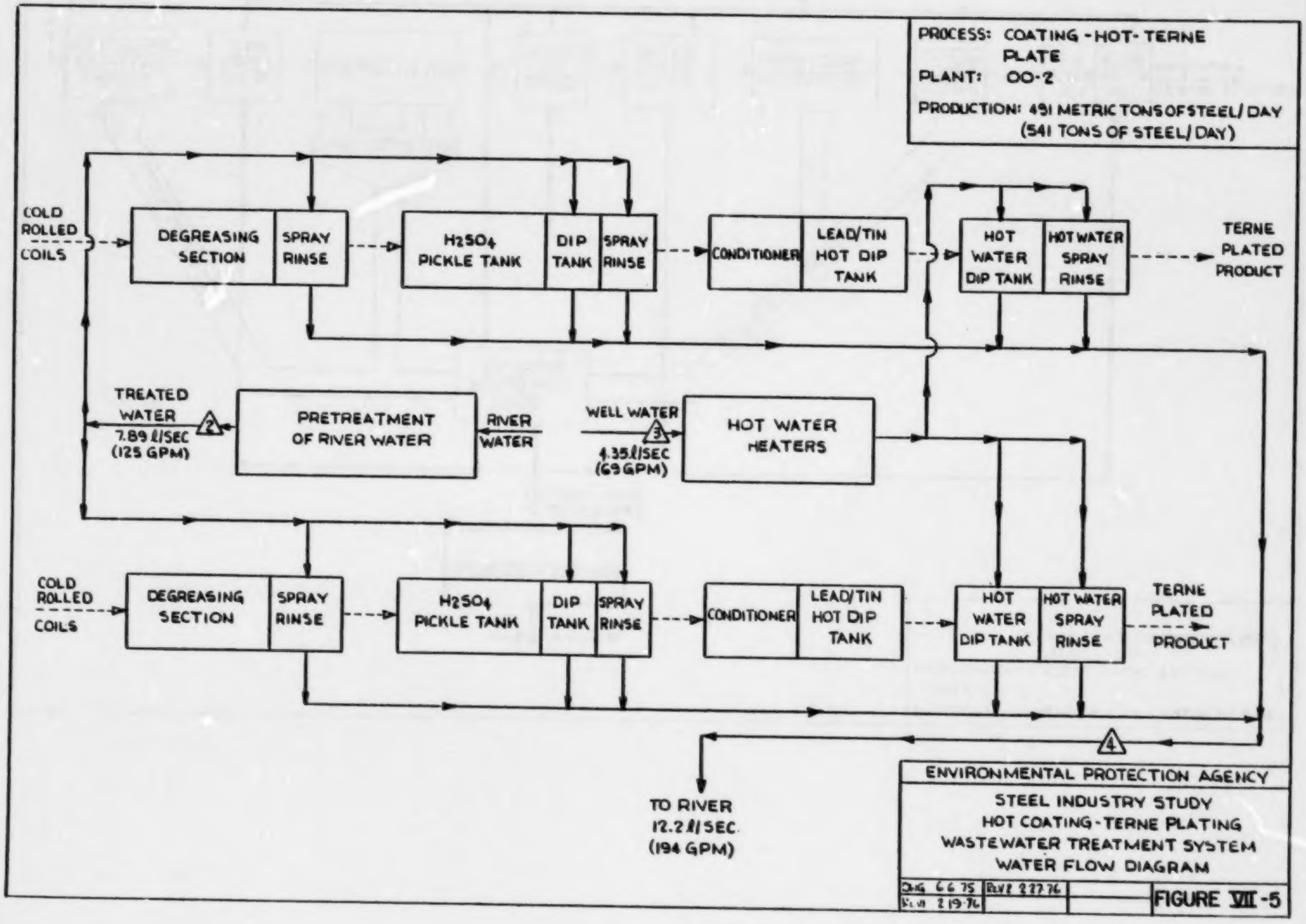
FIGURE VII-3


PROCESS : COATINGS - HOT GALVANIZING
PLANT : NN-2
PRODUCTION : 1588 METRIC TONS OF STEEL/DAY (1751 TONS OF STEEL/DAY)
SPENT PICKLING/CLEANING SOLUTIONS
SPENT SOLUTION HOLDING TANK 113,600ℓ (30,000 GAL)
FIXED ORIFICE
AVG. FLOW 2.2 ℓ/SEC. (35 GPM)
GALVANIZING LINE "A"
GALVANIZING LINE "B"
GALVANIZING LINE "C"
RINSE WATER
RINSE WATER
RINSE WATER
COMBINED MILL SERVICE WATERS USED AS RINSE
NON-CONTACT COOLING WATER FROM ALL LINES
94.7 ℓ/SEC. (1500 GPM)
LIME SLURRY TANK
POLYMER
8330ℓ (2200 GAL.)
8330ℓ (2200 GAL.)
FILTRATE
18.3 m (60 FT.) DIAMETER 1,135,000ℓ (300,000 GAL.)
94.7 ℓ/SEC. (1500 GPM)
TO RECEIVING STREAM
ROTARY DRUM FILTER
SOLIDS TO LANDFILL
CITY WATER 63.0 - 75.7 ℓ/SEC. (1000 - 1200 GPM)
WELL WATER 20.2 - 25.2 ℓ/SEC (320 - 400 GPM)
△ = SAMPLING POINTS
DWG 6-29-74
REV 1 8-19-76
REV 2 9-17-76

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING LINE
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-4

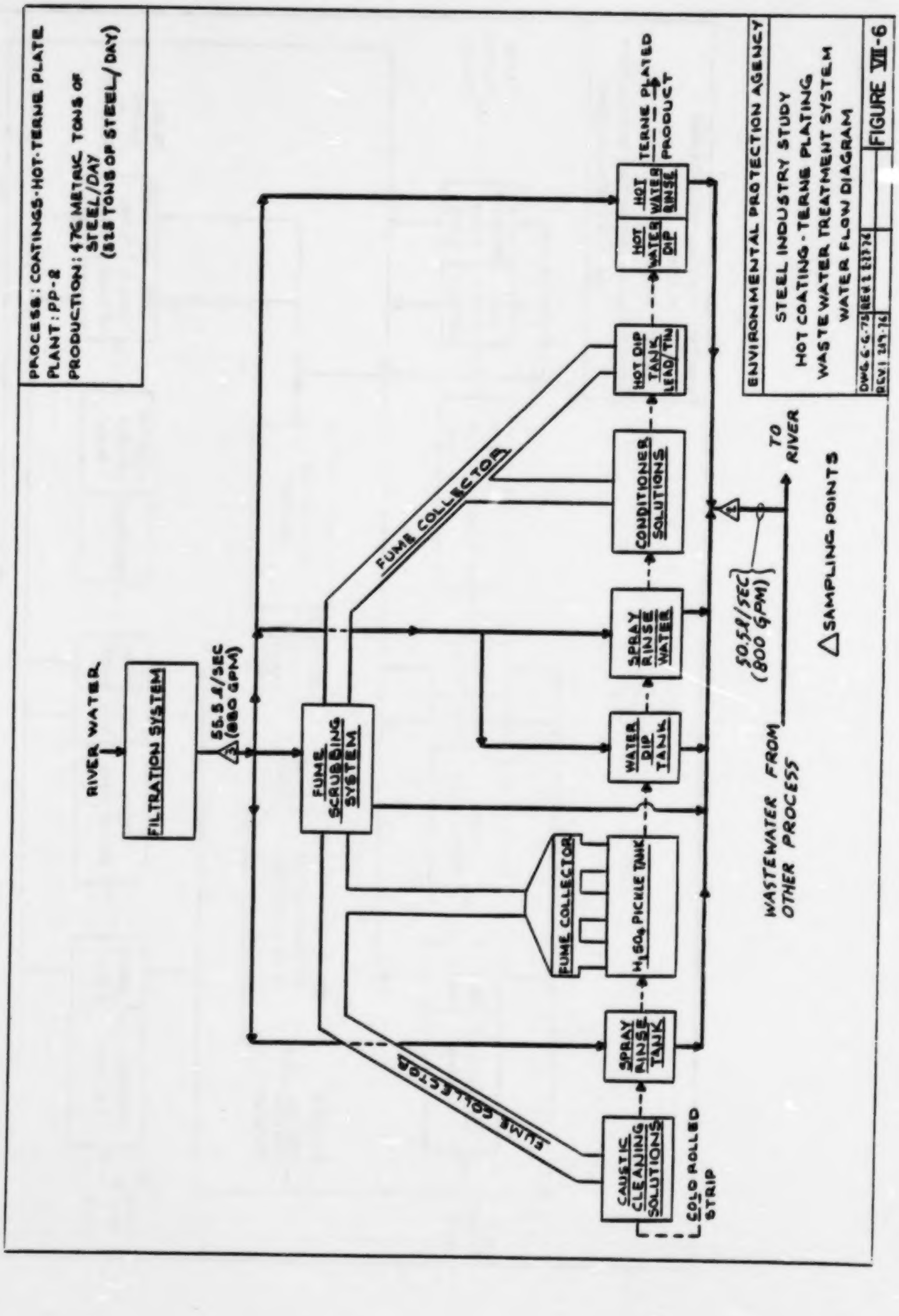

COLD ROLLED COILS
DEGREASING SECTION
SPRAY RINSE
H_2SO_4 PICKLE TANK
DIP TANK
SPRAY RINSE
CONDITIONER
LEAD/TIN HOT DIP TANK
HOT WATER DIP TANK
HOT WATER SPRAY RINSE
TERNE PLATED PRODUCT
TREATED WATER
2
7.89 ℓ/SEC (125 GPM)
PRETREATMENT OF RIVER WATER
RIVER WATER
WELL WATER
3
4.35 ℓ/SEC (69 GPM)
HOT WATER HEATERS
COLD ROLLED COILS
DEGREASING SECTION
SPRAY RINSE
H_2SO_4 PICKLE TANK
DIP TANK
SPRAY RINSE
CONDITIONER
LEAD/TIN HOT DIP TANK
HOT WATER DIP TANK
HOT WATER SPRAY RINSE
TERNE PLATED PRODUCT
4
TO RIVER 12.2 ℓ/SEC. (194 GPM)
DWG 6-6-75
REV 2-27-76
REV 2-19-76

PROCESS: COATING - HOT - TERNE PLATE
PLANT: OO-2
PRODUCTION: 491 METRIC TONS OF STEEL/DAY
(541 TONS OF STEEL/DAY)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING - TERNE PLATING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-5



RIVER WATER
FILTRATION SYSTEM
55.5 l/SEC (880 GPM)
3
FUME SCRUBBING SYSTEM
FUME COLLECTOR
FUME COLLECTOR
FUME COLLECTOR
COLD ROLLED STRIP
CAUSTIC CLEANING SOLUTIONS
SPRAY RINSE TANK
H_2SO_4 PICKLE TANK
WATER DIP TANK
SPRAY RINSE WATER
CONDITIONER SOLUTIONS
HOT DIP TANK LEAD/TIN
HOT WATER DIP
HOT WATER RINSE
TERNE PLATED PRODUCT
WASTEWATER FROM OTHER PROCESS
50.5 l/SEC (800 GPM)
4
TO RIVER
△ SAMPLING POINTS

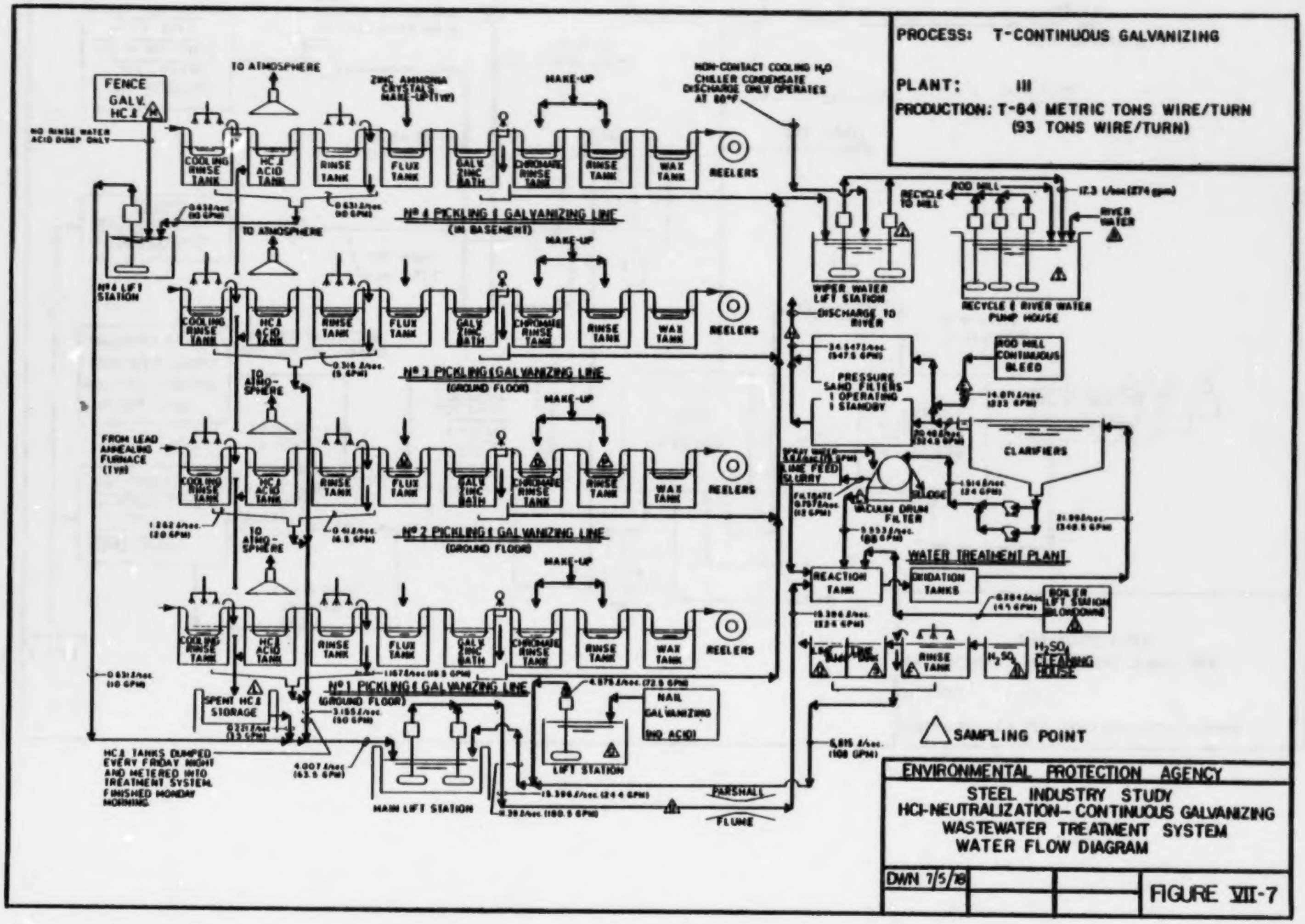
PROCESS: COATINGS-HOT-TERNE PLATE
PLANT: PP-2
PRODUCTION: 476 METRIC TONS OF STEEL/DAY
(525 TONS OF STEEL/DAY)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING - TERNE PLATING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWG. 6-6-75 REV 2 1-27-76
REV 1 2-19-76

FIGURE VII-6


FENCE GALV. HC ℓ
NO RINSE WATER ACID DUMP ONLY
TO ATMOSPHERE
ZINC AMMONIA CRYSTALS MAKE-UP (TYP)
MAKE-UP
NON-CONTACT COOLING H₂O CHILLER CONDENSATE DISCHARGE ONLY OPERATES AT 80°F
COOLING RINSE TANK
HC ℓ ACID TANK
RINSE TANK
FLUX TANK
GALV. ZINC BATH
CHROMATE RINSE TANK
RINSE TANK
WAX TANK
REELERS
0.632 ℓ/sec. (10 GPM)
0.631 ℓ/sec. (10 GPM)
Nº 4 LIFT STATION
Nº 4 PICKLING & GALVANIZING LINE (IN BASEMENT)
0.316 ℓ/sec. (5 GPM)
Nº 3 PICKLING & GALVANIZING LINE (GROUND FLOOR)
TO ATMO-SPHERE
FROM LEAD ANNEALING FURNACE (TYP)
1.262 ℓ/sec. (20 GPM)
0.41 ℓ/sec. (6.5 GPM)
Nº 2 PICKLING & GALVANIZING LINE (GROUND FLOOR)
0.631 ℓ/sec. (10 GPM)
1.167 ℓ/sec. (18.5 GPM)
Nº 1 PICKLING & GALVANIZING LINE (GROUND FLOOR)
SPENT HC ℓ STORAGE
0.221 ℓ/sec. (3.5 GPM)
3.155 ℓ/sec. (50 GPM)
HC ℓ TANKS DUMPED EVERY FRIDAY NIGHT AND METERED INTO TREATMENT SYSTEM. FINISHED MONDAY MORNING
4.007 ℓ/sec. (63.5 GPM)
MAIN LIFT STATION
4.575 ℓ/sec. (72.5 GPM)
NAIL GALVANIZING (NO ACID)
LIFT STATION
15.396 ℓ/sec. (244 GPM)
11.39 ℓ/sec. (180.5 GPM)
PARSHALL FLUME
6.815 ℓ/sec. (108 GPM)
WIPER WATER LIFT STATION
RECYCLE TO MILL
ROD MILL
17.3 ℓ/sec. (274 gpm)
RIVER WATER
RECYCLE & RIVER WATER PUMP HOUSE
DISCHARGE TO RIVER
34.547 ℓ/sec. (547.5 GPM)
PRESSURE SAND FILTERS 1 OPERATING 1 STANDBY
ROD MILL CONTINUOUS BLEED
14.071 ℓ/sec. (223 GPM)
20.48 ℓ/sec. (324.5 GPM)
CLARIFIERS
SPRAY WATER
LIME FEED SLURRY
FILTRATE 0.757 ℓ/sec. (12 GPM)
VACUUM DRUM FILTER
SLUDGE
1.514 ℓ/sec. (24 GPM)
21.99 ℓ/sec. (348.5 GPM)
5.553 ℓ/sec. (88 GPM)
WATER TREATMENT PLANT
REACTION TANK
OXIDATION TANKS
0.284 ℓ/sec. (4.5 GPM)
BOILER LIFT STATION BLOWDOWN
15.396 ℓ/sec. (324 GPM)
LIME TANK
LIME TANK
RINSE TANK
H₂SO₄
H₂SO₄ CLEANING HOUSE
DWN 7/5/78

PROCESS: T-CONTINUOUS GALVANIZING

PLANT: III

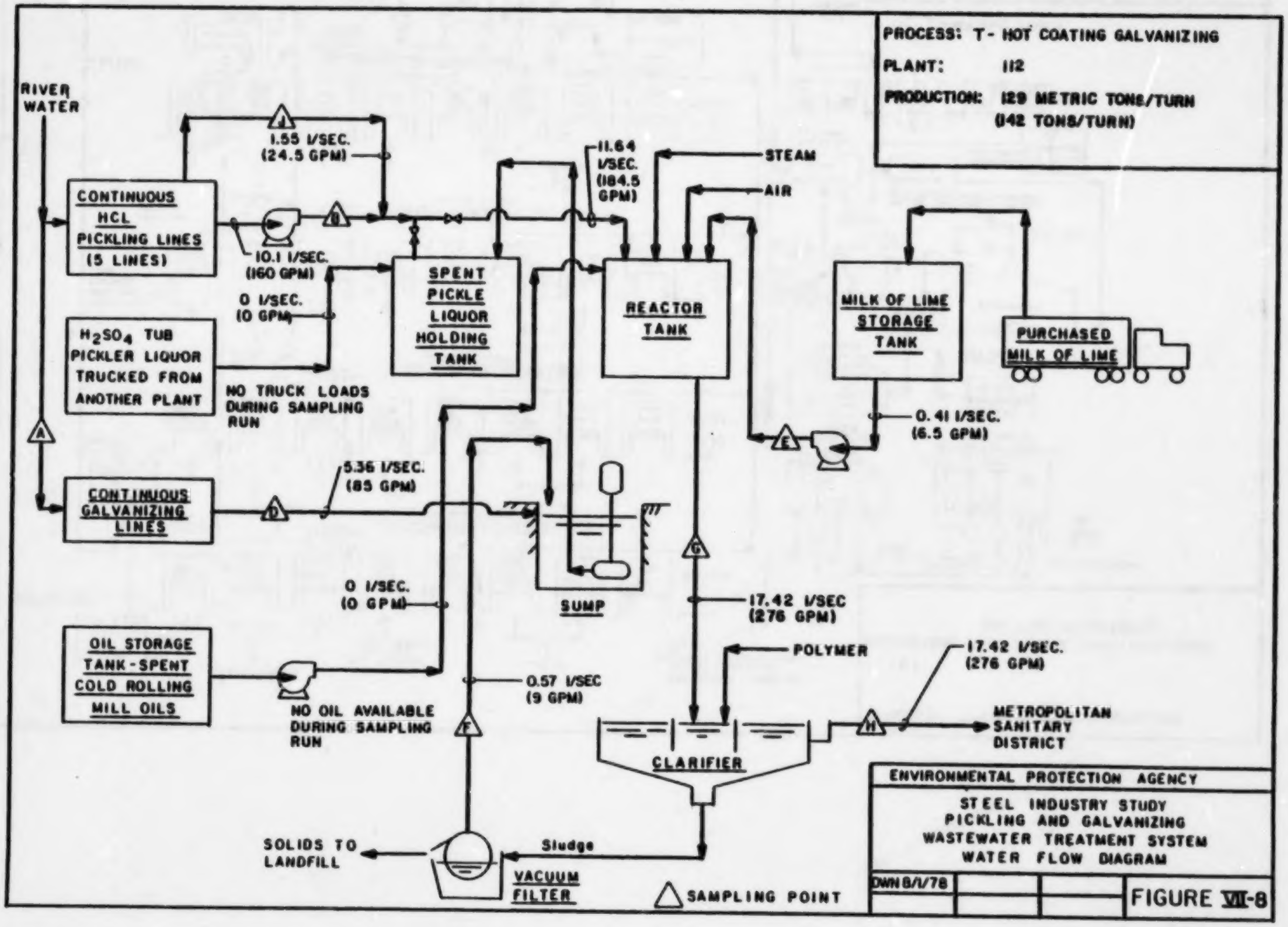
PRODUCTION: T-84 METRIC TONS WIRE/TURN
(93 TONS WIRE/TURN)

△ SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HCl-NEUTRALIZATION- CONTINUOUS GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-7


RIVER WATER
A
CONTINUOUS HCL PICKLING LINES (5 LINES)
C
1.55 l/SEC. (24.5 GPM)
10.1 l/SEC. (160 GPM)
B
H$_2$SO$_4$ TUB PICKLER LIQUOR TRUCKED FROM ANOTHER PLANT
0 l/SEC. (0 GPM)
NO TRUCK LOADS DURING SAMPLING RUN
SPENT PICKLE LIQUOR HOLDING TANK
11.64 l/SEC. (184.5 GPM)
STEAM
AIR
REACTOR TANK
MILK OF LIME STORAGE TANK
PURCHASED MILK OF LIME
0.41 l/SEC. (6.5 GPM)
E
CONTINUOUS GALVANIZING LINES
D
5.36 l/SEC. (85 GPM)
SUMP
0 l/SEC. (0 GPM)
OIL STORAGE TANK-SPENT COLD ROLLING MILL OILS
NO OIL AVAILABLE DURING SAMPLING RUN
G
17.42 l/SEC (276 GPM)
POLYMER
CLARIFIER
H
17.42 l/SEC. (276 GPM)
METROPOLITAN SANITARY DISTRICT
F
0.57 l/SEC (9 GPM)
Sludge
VACUUM FILTER
SOLIDS TO LANDFILL
SAMPLING POINT

PROCESS: T- HOT COATING GALVANIZING

PLANT: 112

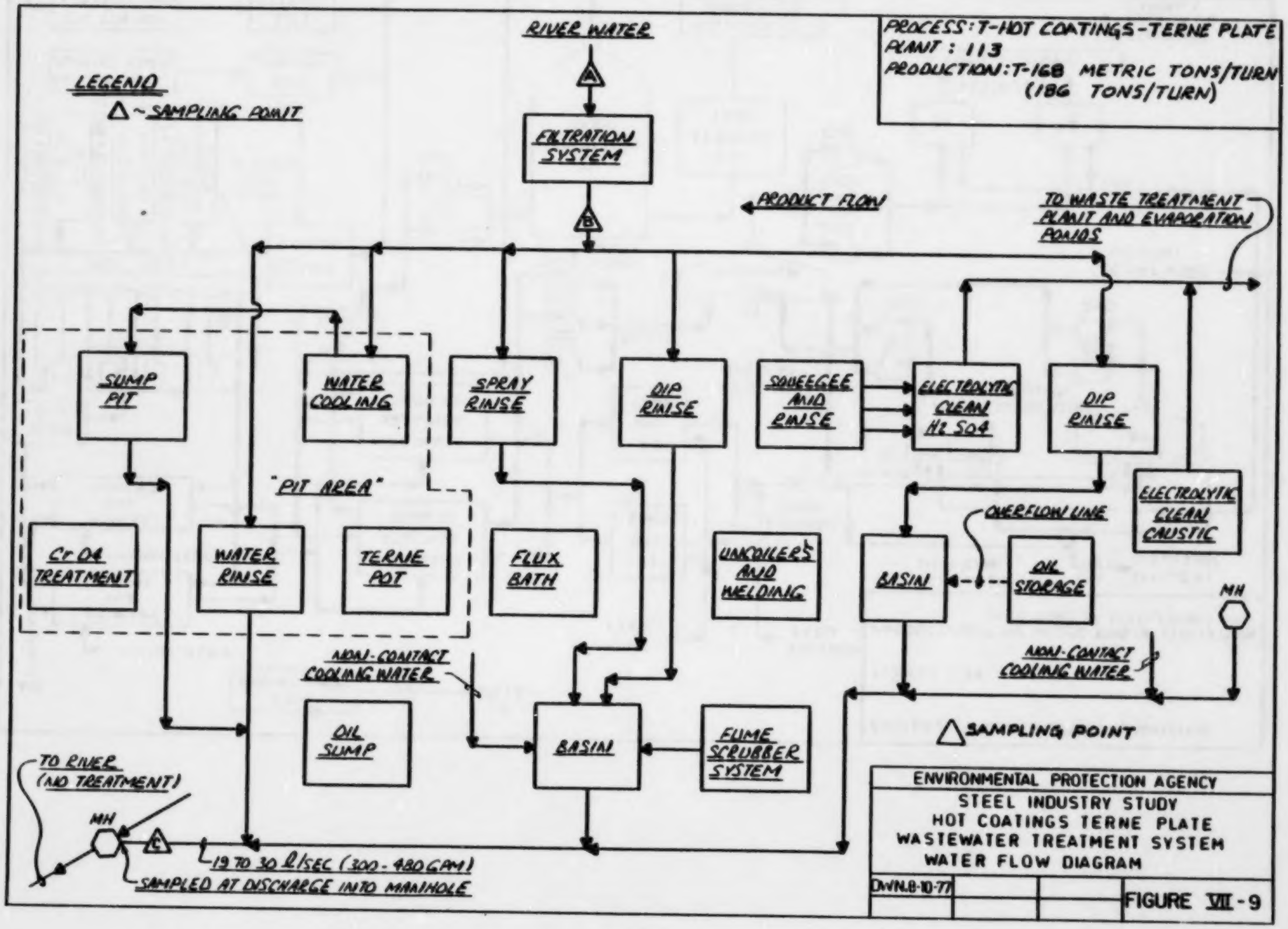
PRODUCTION: 129 METRIC TONS/TURN
(142 TONS/TURN)

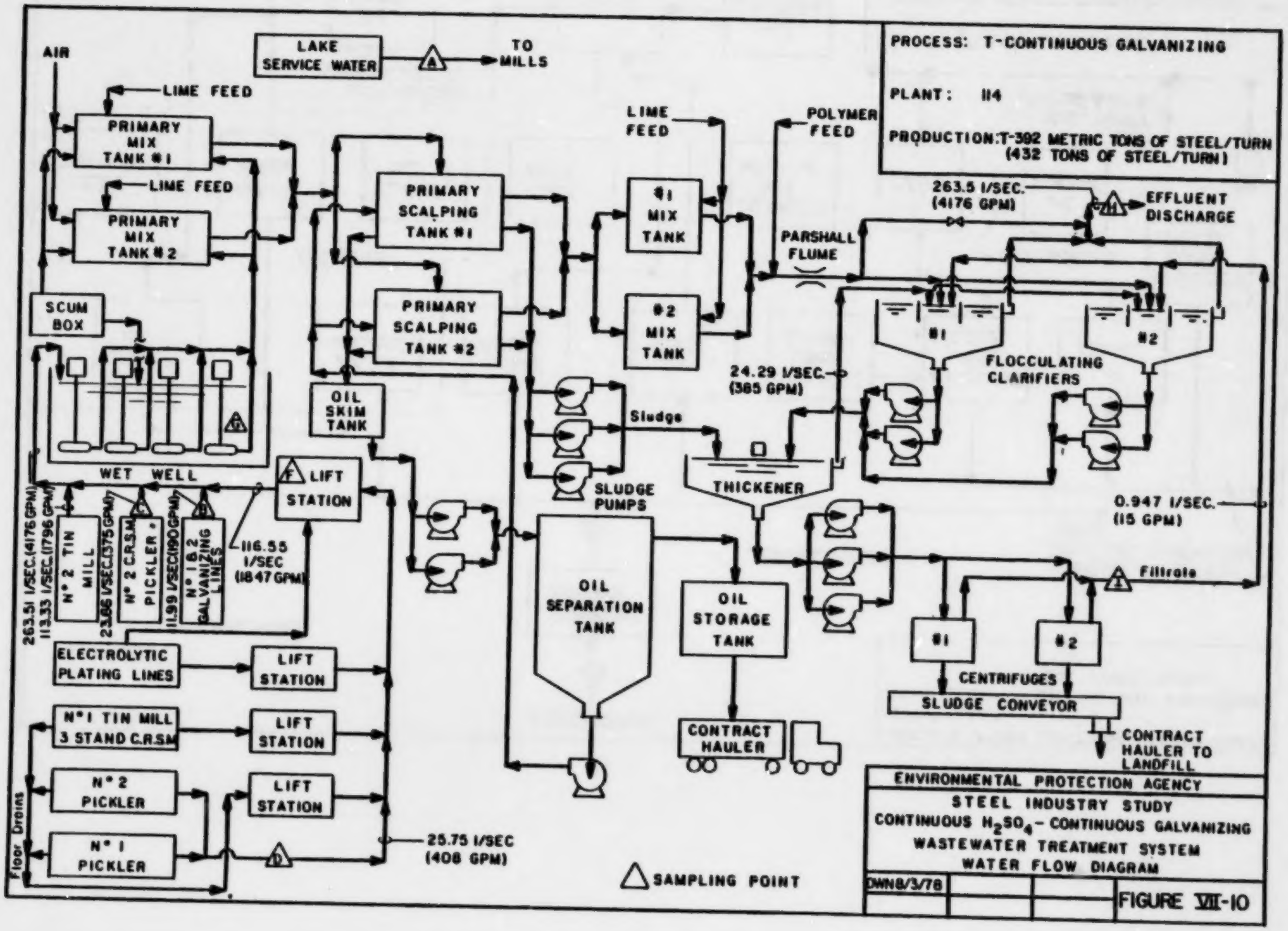
ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
PICKLING AND GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWN 8/1/78

FIGURE VII-8

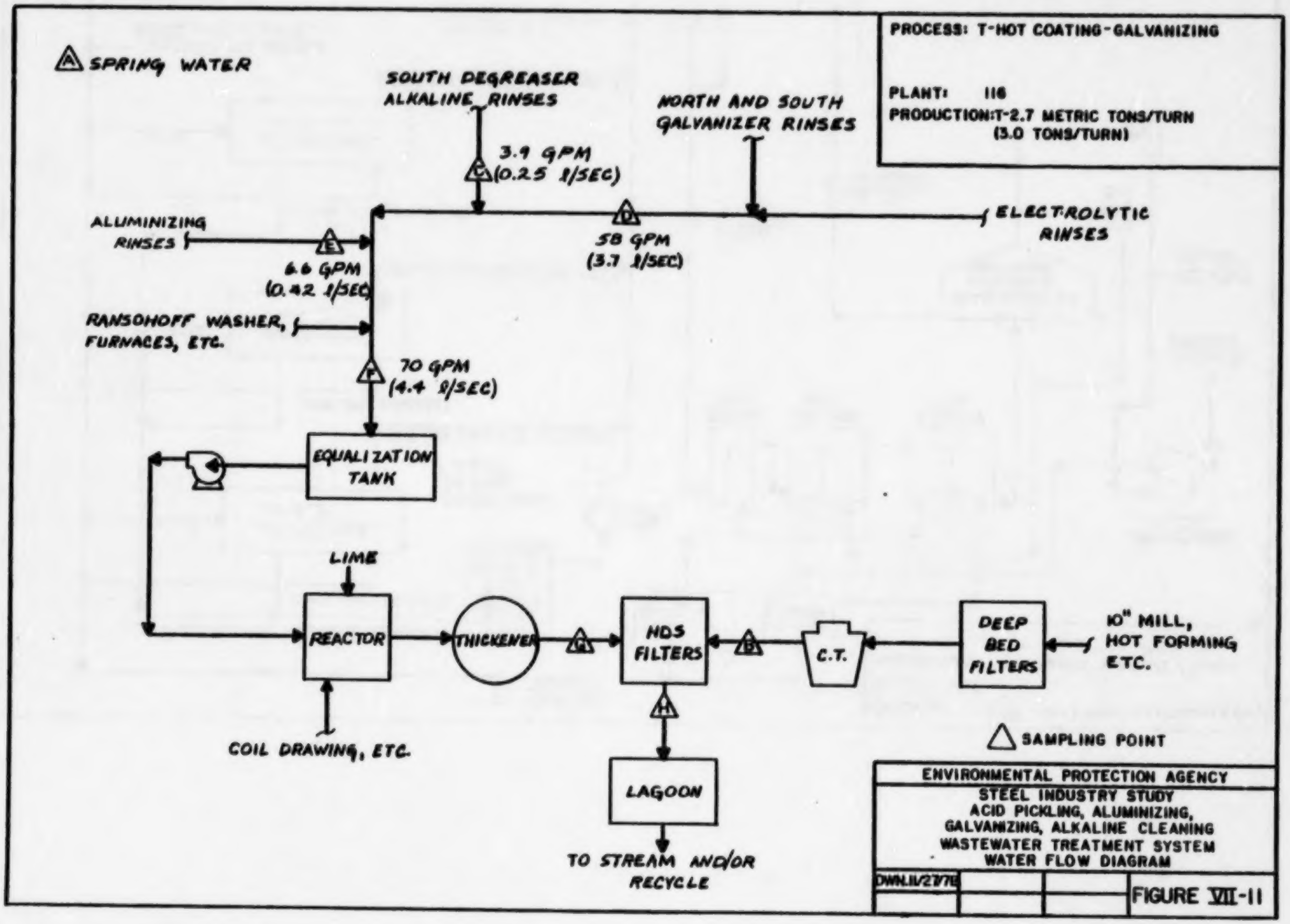

PROCESS: T-HOT COATINGS-TERNE PLATE
PLANT : 113
PRODUCTION: T-168 METRIC TONS/TURN
(186 TONS/TURN)
LEGEND
Δ ~ SAMPLING POINT
RIVER WATER
A
FILTRATION SYSTEM
B
PRODUCT FLOW
TO WASTE TREATMENT PLANT AND EVAPORATION PONDS
SUMP PIT
WATER COOLING
SPRAY RINSE
DIP RINSE
SQUEEGEE AND RINSE
ELECTROLYTIC CLEAN H2 SO4
DIP RINSE
ELECTROLYTIC CLEAN CAUSTIC
"PIT AREA"
Cr O4 TREATMENT
WATER RINSE
TERNE POT
FLUX BATH
UNCOILERS AND WELDING
BASIN
OVERFLOW LINE
OIL STORAGE
MH
NON-CONTACT COOLING WATER
NON-CONTACT COOLING WATER
OIL SUMP
BASIN
FUME SCRUBBER SYSTEM
Δ SAMPLING POINT
TO RIVER (NO TREATMENT)
MH
C
19 TO 30 l/SEC (300-480 GPM)
SAMPLED AT DISCHARGE INTO MANHOLE
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATINGS TERNE PLATE
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM
DWN. 8-10-77
FIGURE VII-9


PROCESS: T-CONTINUOUS GALVANIZING
PLANT: 114
PRODUCTION: T-392 METRIC TONS OF STEEL/TURN (432 TONS OF STEEL/TURN)
AIR
LAKE SERVICE WATER
A
TO MILLS
LIME FEED
PRIMARY MIX TANK #1
LIME FEED
PRIMARY MIX TANK #2
SCUM BOX
G
WET WELL
263.51 l/SEC.(4176 GPM)
113.33 l/SEC.(1796 GPM)
N° 2 TIN MILL
23.66 l/SEC.(375 GPM)
C
N° 2 C.R.S.M. PICKLER
11.99 l/SEC(190 GPM)
B
N° 1 & 2 GALVANIZING LINES
116.55 l/SEC (1847 GPM)
F
LIFT STATION
ELECTROLYTIC PLATING LINES
LIFT STATION
N° 1 TIN MILL 3 STAND C.R.S.M
LIFT STATION
N° 2 PICKLER
LIFT STATION
N° 1 PICKLER
D
Floor Drains
25.75 l/SEC (408 GPM)
PRIMARY SCALPING TANK #1
PRIMARY SCALPING TANK #2
OIL SKIM TANK
Sludge
SLUDGE PUMPS
OIL SEPARATION TANK
LIME FEED
#1 MIX TANK
#2 MIX TANK
POLYMER FEED
PARSHALL FLUME
263.5 l/SEC. (4176 GPM)
H
EFFLUENT DISCHARGE
#1
#2
FLOCCULATING CLARIFIERS
24.29 l/SEC. (385 GPM)
THICKENER
OIL STORAGE TANK
CONTRACT HAULER
0.947 l/SEC. (15 GPM)
I
Filtrate
#1
#2
CENTRIFUGES
SLUDGE CONVEYOR
CONTRACT HAULER TO LANDFILL
SAMPLING POINT
DWN 8/3/78

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
CONTINUOUS H_2SO_4 – CONTINUOUS GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-10

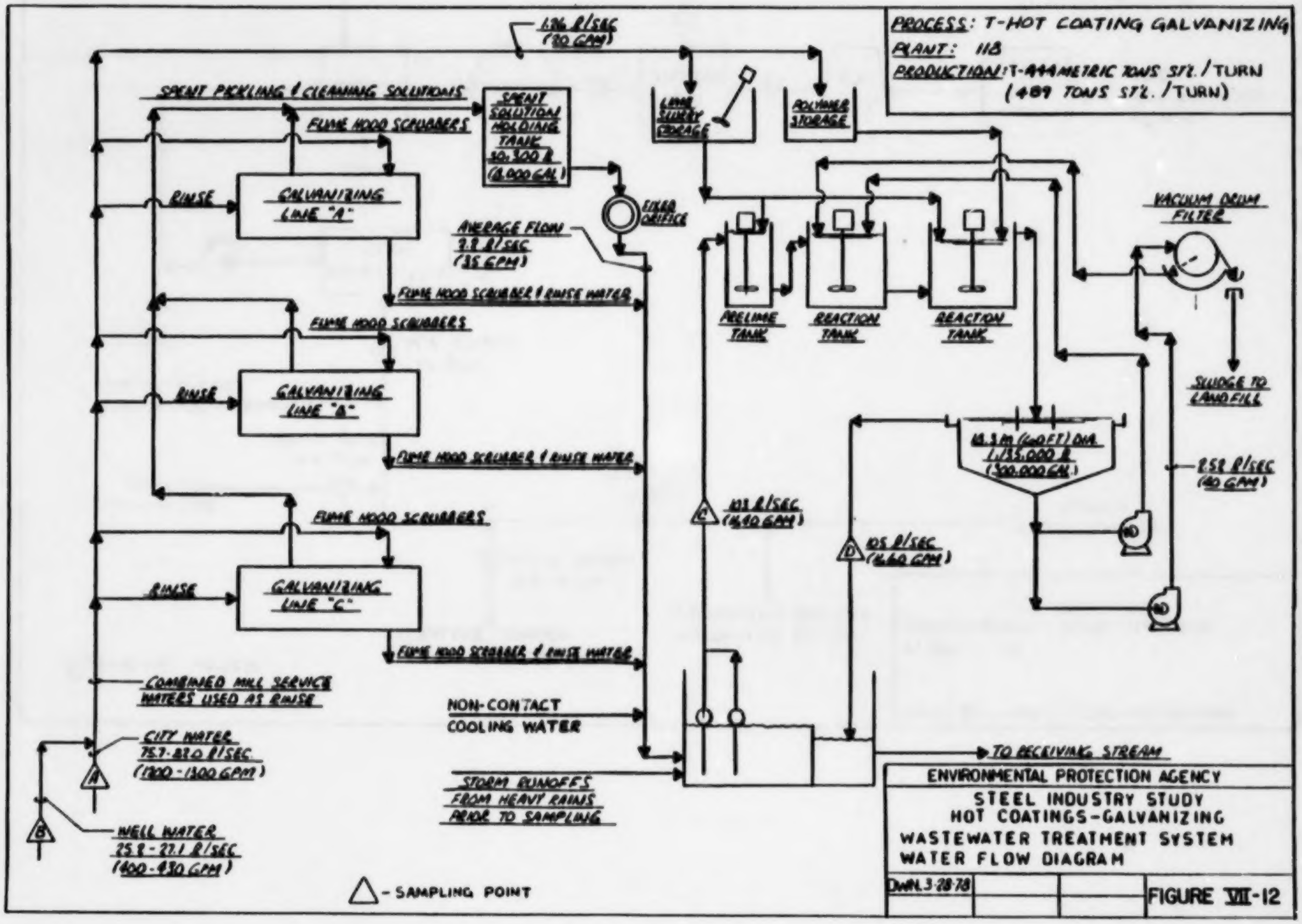

A SPRING WATER
SOUTH DEGREASER ALKALINE RINSES
C
3.9 GPM (0.25 l/SEC)
NORTH AND SOUTH GALVANIZER RINSES
ELECTROLYTIC RINSES
D
58 GPM (3.7 l/SEC)
ALUMINIZING RINSES
E
6.6 GPM (0.42 l/SEC)
RANSOHOFF WASHER, FURNACES, ETC.
F
70 GPM (4.4 l/SEC)
EQUALIZATION TANK
LIME
REACTOR
COIL DRAWING, ETC.
THICKENER
G
HDS FILTERS
B
C.T.
DEEP BED FILTERS
10" MILL, HOT FORMING ETC.
H
LAGOON
TO STREAM AND/OR RECYCLE
△ SAMPLING POINT
DWN.11/27/78

PROCESS: T-HOT COATING-GALVANIZING

PLANT: 116
PRODUCTION:T-2.7 METRIC TONS/TURN
(3.0 TONS/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
ACID PICKLING, ALUMINIZING,
GALVANIZING, ALKALINE CLEANING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-11

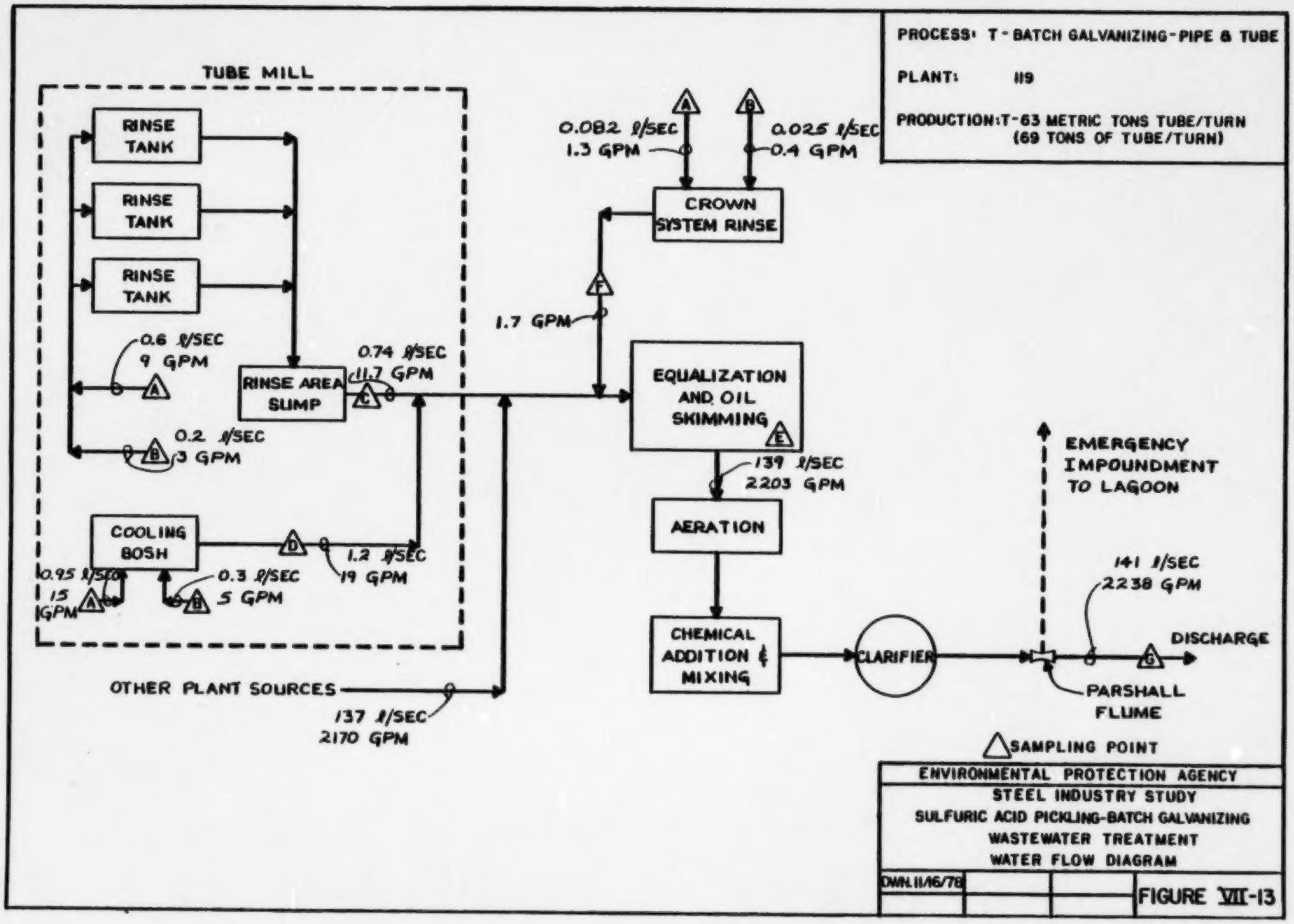

PROCESS: T-HOT COATING GALVANIZING
PLANT: 118
PRODUCTION: T-444 METRIC TONS STL./TURN
(489 TONS STL./TURN)
1.26 l/SEC
(20 GPM)
SPENT PICKLING & CLEANING SOLUTIONS
FUME HOOD SCRUBBERS
SPENT SOLUTION HOLDING TANK
30,300 l
(8,000 GAL)
FIXED ORIFICE
AVERAGE FLOW
2.2 l/SEC
(35 GPM)
RINSE
GALVANIZING LINE "A"
FUME HOOD SCRUBBER & RINSE WATER
FUME HOOD SCRUBBERS
RINSE
GALVANIZING LINE "B"
FUME HOOD SCRUBBER & RINSE WATER
FUME HOOD SCRUBBERS
RINSE
GALVANIZING LINE "C"
FUME HOOD SCRUBBER & RINSE WATER
COMBINED MILL SERVICE WATERS USED AS RINSE
CITY WATER
75.7-82.0 l/SEC
(1200-1300 GPM)
A
B
WELL WATER
25.2-27.1 l/SEC
(400-430 GPM)
NON-CONTACT COOLING WATER
STORM RUNOFFS FROM HEAVY RAINS PRIOR TO SAMPLING
LIME SLURRY STORAGE
POLYMER STORAGE
PRELIME TANK
REACTION TANK
REACTION TANK
VACUUM DRUM FILTER
SLUDGE TO LANDFILL
18.3 m (60 FT) DIA.
1,135,000 l
(300,000 GAL.)
2.52 l/SEC
(40 GPM)
C
103 l/SEC
(1640 GPM)
D
105 l/SEC
(1660 GPM)
TO RECEIVING STREAM
△ - SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS-GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWN. 3-28-78

FIGURE VII-12


TUBE MILL
RINSE TANK
RINSE TANK
RINSE TANK
0.6 l/SEC
9 GPM
A
0.2 l/SEC
3 GPM
B
RINSE AREA SUMP
C
0.74 l/SEC
11.7 GPM
COOLING BOSH
0.95 l/SEC
15 GPM
A
0.3 l/SEC
5 GPM
B
D
1.2 l/SEC
19 GPM
OTHER PLANT SOURCES
137 l/SEC
2170 GPM
A
B
0.082 l/SEC
1.3 GPM
0.025 l/SEC
0.4 GPM
CROWN SYSTEM RINSE
F
1.7 GPM
EQUALIZATION AND OIL SKIMMING
E
139 l/SEC
2203 GPM
AERATION
CHEMICAL ADDITION & MIXING
CLARIFIER
EMERGENCY IMPOUNDMENT TO LAGOON
141 l/SEC
2238 GPM
G
DISCHARGE
PARSHALL FLUME
SAMPLING POINT

PROCESS: T-BATCH GALVANIZING-PIPE & TUBE

PLANT: 119

PRODUCTION: T-63 METRIC TONS TUBE/TURN
(69 TONS OF TUBE/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
SULFURIC ACID PICKLING-BATCH GALVANIZING
WASTEWATER TREATMENT
WATER FLOW DIAGRAM

DWN. 11/16/78

FIGURE VII-13

HOT COATING SUBCATEGORY

SECTION VIII

COST, ENERGY, AND NON-WATER QUALITY IMPACTS

Introduction

This section presents the incremental costs to be incurred in applying the different levels of pollution control technology to the hot coating subcategory. The analysis also describes energy requirements, non-water quality impacts (including air pollution, solid waste disposal and water consumption), and the costs for each alternative treatment system. Summaries of the alternative treatment system applicable to each hot coating operation are depicted in Figures VIII-1 and VIII-2.

Costs

The water pollution control costs for eight of the nine plants visited during the study are presented in Table VIII-1. Unusable cost data were provided for one plant. With the exception of Plant 116 (see footnote 2 on table), all costs apply to galvanizing operations only. At Plant 116, the costs include treatment of aluminizing and alkaline cleaning wastewaters in addition to galvanizing. Terne coating wastewater treatment systems were under construction at three sites, at the time of plant visits. Thus, cost data were not reported for these operations. The treatment systems net raw waste and gross effluent loads are described in Sections V, VI, and VII. The cost data were supplied by the operators of each plant in current year dollars. The Agency converted these data to July, 1978 dollars. A standard capital recovery factor was used so that the annualized capital costs would be comparable.

Cost Comparisons for Facilities in Place

In order to determine whether its cost estimates are accurate and cover actual site-specific costs, the Agency compared costs reported by plants (including all site-specific and retrofit costs) with model-based estimates of facilities in place. These data are summarized below:

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Plant	Coated Product	Plant Reported Costs From Table VIII-1	Model-based Estimate of Facilities In Place
For Sampled Plants			
112I	Fasteners	2,958,000[1]	584,400[1]
396A	Strip/Sheet	509,050	533,500
476A	Pipe & Tube	61,500	281,000
612	Wire	670,020	974,500
856F	Sheet	944,270	961,400
856P	Wire	14,310	12,600
920E	Strip/Sheet	1,500,930	1,575,300
Subtotal		3,700,080	4,338,300
D-DCP Data			
0580A	Wire	55,137	110,000
0728	Pipe	211,785[2]	37,200
0868A	Strip	233,232	1,667,700
0920F	Strip(Terne)	36,800	171,800
Subtotal		536,954	1,986,700
TOTAL (excluding 112I 476A and 868A)		3,442,302	4,376,300
TOTAL (including all plants)		7,195,034	6,909,400

[1] Costs omitted from subtotal. Plant reported costs are for many operations other than hot coating, while model-based estimates are for hot coating only. See text discussion below for Plant 112I.

[2] Plant reported costs included a cooling tower, model-based costs do not.

With the exception of the two cases referred to in footnotes above, model-based estimates tend to be higher than actual plant costs, reflecting that model estimates adequately take into account site-specific costs. The few widely divergent costs reflect problems in apportioning total treatment plant costs for large central treatment systems back to individual small lines. The owner of Plant 112I allocated the $9.7 million capital expense of a plant-wide treatment system by assigning $5.4 million to the chemical treatment portion of this system, then further estimating that about 50-60 percent of such costs pertain to treatment of wastewaters from galvanizing, aluminizing, alkaline cleaning, and electrolytic coating operations at this plant. Since sufficient information was not available, the Agency did not attempt to further allocate the reported plant-wide costs to the hot coating operation. The $2.9 million shown, therefore, includes treatment of wastewaters from more operations than the model-based estimate of $584,400 for hot coating wastewaters only.

A large, plant-wide central treatment plant costing $7.1 million has been installed at Plant 0476A. Problems were encountered in factoring costs for the 2200 GPM treatment facility back to the 20 GPM pipe and tube galvanizing line. Model-based estimates which are based upon separate treatment are 4.6 times higher than apportioned costs where galvanizing flows were less than one percent of total flows. A similar situation exists at Plant 0868A, where model-based estimates are seven times higher than plant-apportioned costs. The total treatment plant cost for Plant 0868A is listed as $4.86 million in Table VIII-1. Conversely, Plant 0728 costs include a cooling tower necessary to recycle wastewater to processes other than galvanizing, while the model-based estimate do not include costs for cooling equipment. However, these were exceptions to generally comparable actual and estimated investment costs, and overall estimates based on model treatment systems appear reasonable and accurate. For the two plants where separate treatment of hot coating wastewaters is practiced (0920E and 0920F), model-based estimates are higher than plant-reported actual costs. Based upon the above, the Agency concludes that its model based cost estimates are sufficiently generous to cover site specific and retrofit costs for the hot coating subcategory.

Control and Treatment Technology (C&TT)

The wastewater treatment components in use or available for hot coating line operations are presented in Table VIII-4. Table VIII-4 also presents the following information for each treatment step:

1. Description
2. Implementation time
3. Land requirements

Model costs associated with the alternative treatment systems including investment, annualized capital costs, operation and maintenance, and energy and power are presented in Tables VIII-5 through VIII-34. Columns on cost tables are identified by letters corresponding to the appropriate treatment technology step identified in Table VIII-4.

Estimated Costs for the Installation of Pollution Control Technologies

A. Costs Required to Achieve the BPT Limitations

The model BPT treatment system provides for the following control measures: the blending and equalization of wastes from all rinsing and scrubbing operations; chromium reduction (if hexavalent chromium is present, e.g., bright dip rinse at galvanizing lines); neutralization of all wastewaters with lime or other suitable alkali; the addition of polymer with flocculation and settling in a clarifier; vacuum filtration of underflow sludges; and continuous surface skimming for oil removal. All flows from rinsing and scrubbing operations including fume scrubbing are discharged once-through following treatment.

Cost estimates for these BPT model treatment systems are provided in Tables VIII-5 through VIII-14. Using model costs as a basis, estimates were made of the cost of bringing each hot coating plant into compliance with the BPT limitations. The cost of each BPT model component was calculated for each plant by adjusting the model cost to the actual production capacities reported for each plant using the six-tenths factor rule. Table VIII-35 summarizes the expenditures which have been made and which are still necessary (as of July 1, 1981) to bring all hot coating operations into compliance with the BPT limitations. The estimated required cost of compliance for hot coating operations to attain the BPT limitations is about $3.2 million. The associated annual costs for these systems will be $0.7 million. These costs are conservative, since they are based on co-treatment of only hot coating wastewaters at a given plant site. In actual practice, hot coating wastewaters are co-treated with those from other forming and finishing operations. The economies of scale which result reduce capital investment and annual operating costs.

B. Costs Required to Achieve the BAT Limitations

The Agency evaluated three alternative treatment systems which are designed to further reduce toxic pollutant discharges from hot coating operations. Two of the three include rinse water reduction to minimize flows from the process. All three alternatives include recycle of scrubber wastewaters, with minimal blowdown to treatment. Due to flow reductions, the existing BPT treatment system is able to function more efficiently, achieving lower effluent concentrations. As alternatives, this reduced BAT effluent may be further treated either by filtration, or by an evaporation and condensation system designed to produce dry solids and water which is reused in the process. This latter treatment alternative achieves zero discharge of pollutants to receiving streams, but requires the expenditure of large amounts of energy and capital.

BAT model alternative treatment system costs are provided in Tables VIII-15 thorugh VIII-24. The total capital and annual costs for all hot coating operations to attain the alternative BAT limitations are:

Alternatives	Millions of 1978 Dollars Capital Cost ($)	Annual Cost ($)
BAT 1	0.87	0.12
BAT 2	12.8	1.64
BAT 3	119.8	18.7

C. Costs Required to Achieve the BCT Limitations

The promulgated BCT limitations are identical to the BPT limitations. Thus, no additional treatment and costs are required.

D. Costs Required to Achieve NSPS

Four NSPS alternative treatment systems have been evaluated for hot coating operations. These systems are the same as the BPT and BAT alternative treatment systems previously described. Model capital and annual operating costs are provided in Tables VIII-25 through VIII-34.

E. Costs Required to Achieve PSES and PSNS

Pretreatment standards apply to those plants discharging to POTWs. For new source POTW dischargers, the PSNS alternative treatment systems are the same as the NSPS alternatives discussed in the preceding paragraph. For PSES the Agency considered four alternative treatment systems which are the same as the BPT and the three BAT alternative treatment systems. The model capital and annual costs are the same as the BPT and the sum of the BPT and each BAT alternative treatment system. These model costs are presented in Table VIII-5 through VIII-24.

The subcategory-wide costs were calculated in the same manner as the BPT costs and are as follows:

Alternative	Millions of 1978 Dollars Capital Costs	Annual Costs
PSES 1	$ 4.97	$0.73
PSES 2	$ 5.05	$0.74
PSES 3	$ 6.55	$0.95
PSES 4	$27.97	$4.09

Energy Impacts

Moderate amounts of energy are required to operate wastewater treatment systems for hot coating operations. Most of the energy is consumed in operating the BPT model treatment systems, many of which are already in place. The Agency estimates that BPT model treatment systems will use approximately 22 million kilowatt-hours of electricity per year. This is a relatively insignificant (0.04%) portion of the 57 billion kilowatt-hours used in the steel industry in 1978. Ninety percent of the electricity needed to operate hot coating treatment systems is associated with treatment of galvanizing wastewaters. Refer to Table VIII-2 for a breakdown by type of hot coating line.

The additional requirements for upgrading BPT treatment systems to BAT levels are shown in Table VIII-3. Note that two of the three BAT alternative treatment systems require only minor incremental energy consumption. Only Alternative 3, which includes evaporation technology, consumes significant additional energy.

Energy impacts at the NSPS and PSNS alternatives are slightly less than the requirements at the corresponding BPT, and combined BPT and BAT alternatives, since flow reduction is included as the first step to minimize the volume of wastewater requiring treatment. The Agency did not, however, calculate total subcategory impacts for NSPS and PSNS, since predictions of capacity expansion are not included in this study. The energy consumptions on a model basis are presented in Table VIII-4.

The energy impacts for the PSES alternative pretreatment systems are moderate. The energy requirements are presented in Table VIII-5 for each of the alternatives.

Non-water Quality Impacts

Air Pollution

Air pollution impacts from hot coating treatment systems are minimal. Cooling towers are not included in the model treatment systems, and the only treatment step which could potentially affect air quality is the chromium reduction step required at a few galvanizing lines. Sulfur dioxide, which is one of the treatment chemicals, can be emitted to the atmosphere through careless use. The potential emissions are, however, minimal, and relatively simple precautions will eliminate the potential for liberating sulfur dioxide. Well-maintained plants have demonstrated that no air pollution impact need occur.

Solid Wastes

The major non-water quality impact associated with the treatment of wastewaters from hot coating operations is the generation of metallic hydroxide sludges during treatment. The BPT level of treatment would yield 400-500 tons per year of sludge from a typical 800 TPD galvanizing operation. On a dry weight basis, over 7700 tons of solids per year are generated for the entire subcategory at BPT. Most hot coating wastewater treatment sludges are disposed of at landfills on or off site. Since most BPT treatment systems are currently installed, these sludges are currently being produced and disposed. The Agency recognizes that toxic metals can be leached from these sludges and that improper disposal practices could result in discharges to navigable waters or contamination of groundwater. To the extent such situations arise, they will be addressed under the Resource Conservation and Recovery Act or the NPDES permit program. The Agency has included costs in its cost estimates for properly disposing of these wastes.

Solid waste generation at the BAT level is significantly less than that cited for the BPT model treatment systems as shown below. The sludge characteristics for Alternatives 1 and 2 are similar to BPT, and the previous discussion on sludge disposal applies to those two alternatives for each type of hot coating operation. Alternative 3 converts all remaining pollutants in the effluent from hot coating into dry solids. These sludges will be disposed of along with the sludges generated at BPT. Solid waste production at BAT is as follows:

Alternative	(Dry) Tons/Year
BAT 1	116.9
BAT 2	533.3
BAT 3	22,700

The Agency believes, however, that the effluent reduction benefits associated with compliance with the limitations and standards justify any adverse environmental effects associated with solid waste disposal. Most of the solid wastes described above are presently being generated and disposed of. The Agency believes that these wastes can be disposed of properly and in a safe manner.

Water Consumption

Impacts on water consumption at the BPT and BAT levels are minimal or nonexistent. Aside from recycle of fume scrubber wastewaters, all wastewaters are discharged on a once-through basis. Since the temperature of the recycled scrubber wastewaters are not raised, there are no significant evaporative losses. Hence, the Agency concludes that there are no significant consumptive uses of water associated with the treatment of hot coating process wastewaters.

Summary of Impacts

The Agency concludes that the effluent reduction benefits associated with compliance with these limitations and standards outweigh the adverse non-water quality impacts associated with energy consumption, air pollution, solid waste disposal, and water consumption:

Direct Dischargers
Effluent Loadings (Tons/Yr)

	Raw Waste	BPT/BCT	BAT 1
Flow, MGD	22.9	22.8	18.3
TSS	2658	588	471
Oil & Grease	1060	109	87
Toxic Metals	1830	12	10
Toxic Organics	-	-	-
Nonconventional	364	27	22

Indirect Dischargers
Effluent Loadings (Tons/Yr)

	Raw Waste	PSES 2
Flow, MGD	7.5	5.6
TSS	612	142
Oil & Grease	218	26
Toxic Metals	269	3
Toxic Organics	-	-
Nonconventional	80	6

The Agency also concludes that the effluent reduction benefits associated with compliance with new source standards (NSPS, PSNS) outweigh the adverse non-water quality environmental impacts.

TABLE VIII-1

EFFLUENT TREATMENT COSTS REPORTED BY SAMPLED PLANTS
HOT COATING OPERATIONS

Plant	I-2* 0856P	MM-2* 0856F	NN-2$^{(1)}$ 0920E	111* 0612	112* 0396A	116* 0112I	118$^{(1)}$ 0920E	119* 0476A
Initial Investment	14,310	944,270	1,500,930	670,020	509,050	2,958,000$^{(2)}$	1,500,930	61,500
Annual Costs								
Operating Labor	NR	13,349	129,423	20,365	30,496	90,500	36,893	1,709
Utilities	NR	42,858		44,804		24,000	67,224	1,588
Maintenance	225	18,737		37,987		25,000	67,695	1,128
Capital$^{(3)}$	1,286	84,890	134,934	60,235	45,764	265,924	134,934	5,529
Other	136	36,768	-	-	-	8,500	-	2,582
TOTAL	1,647	196,602	264,357	163,391	76,260	413,924	306,746	12,536
$/Ton	0.382	1.096	0.580	2.124	0.689	9.830	0.856	0.777
$/1000 gal trt.	1.739	2.044	0.470	1.507	2.399	15.122	0.719	5.293

---

(1) NN-2 and 118 are the same plant. This solo-treated galvanizing operation was sampled during both surveys.
(2) Plant estimated share of total cost attributed to processes surveyed at this site. Costs include galvanizing, aluminizing, and alkaline treatment systems on-site.
(3) Standardized capital costs are shown for each plant.

*: Portion attributed to this subcategory only.
NR: No costs provided by company.

TABLE VIII-2

ENERGY REQUIREMENTS TO ACHIEVE BPT LIMITS HOT COATING OPERATIONS

Process	Mode	Power Required kw	Power Required hp	Annual Cost 7/1/78 Dollars
Galvanizing				
Strip/Sheet & Misc. Products	w/scrubbers	72	97	11,300
	wo/scrubbers	57	76	8,800
Wire Products & Fasteners	w/scrubbers	56	75	8,700
	wo/scrubbers	39	53	6,100
Terne Coating				
Strip/Sheet	w/scrubbers	40	54	6,200
	wo/scrubbers	31	41	4,800
Other Coatings				
Strip/Sheet & Misc. Products	w/scrubbers	54	72	8,300
	wo/scrubbers	48	65	7,500
Wire Products & Fasteners	w/scrubbers	22	30	3,400
	wo/scrubbers	10	13	1,500

NOTE: Above energy requirements also apply to BCT, PSES-1, PSNS-1 and NSPS-1.

TABLE VIII-3

ENERGY REQUIREMENTS TO ACHIEVE EFFLUENT LIMITATIONS AND STANDARDS HOT COATING OPERATIONS

Process	Alternative	Mode	Power Required kw	Power Required hp	Annual Cost 7/1/78 Dollars
Galvanizing					
Strip/Sheet & Miscellaneous Products	BAT-1;PSES-2	w/scrubbers	5	7	800
		wo/scrubbers	-	-	-
	BAT-2;PSES-3	w/scrubbers	10	14	1,600
		wo/scrubbers	4	5	600
	BAT-3;PSES-4	w/scrubbers	602	807	93,900
		wo/scrubbers	496	665	77,400
Wire Products & Fasteners	BAT-1;PSES-2	w/scrubbers	5	7	800
		wo/scrubbers	-	-	-
	BAT-2;PSES-3	w/scrubbers	8	11	1,300
		wo/scrubbers	2	3	300
	BAT-3;PSES-4	w/scrubbers	393	527	61,300
		wo/scrubbers	228	305	35,500
Terne Coating					
Strip/Sheet	BAT-1;PSES-2	w/scrubbers	4	5	600
		wo/scrubbers	-	-	-
	BAT-2;PSES-3	w/scrubbers	6	8	900
		wo/scrubbers	1	2	200
	BAT-3;PSES-4	w/scrubbers	287	385	44,800
		wo/scrubbers	205	275	32,000
Other Metal Coatings					
Strip/Sheet & Miscellaneous Products	BAT-1;PSES-2	w/scrubbers	4	5	600
		wo/scrubbers	-	-	-
	BAT-2;PSES-3	w/scrubbers	6	8	900
		wo/scrubbers	2	3	300
	BAT-3;PSES-4	w/scrubbers	369	495	57,600
		wo/scrubbers	280	375	43,600
Wire Products & Fasteners	BAT-1;PSES-2	w/scrubbers	4	5	600
		wo/scrubbers	-	-	-
	BAT-2;PSES-3	w/scrubbers	4	6	700
		wo/scrubbers	1	1	100
	BAT-3;PSES-4	w/scrubbers	78	105	12,200
		wo/scrubbers	37	50	5,800

TABLE VIII-3
ENERGY REQUIREMENTS TO ACHIEVE EFFLUENT LIMITATIONS AND STANDARDS
HOT COATING OPERATIONS
PAGE 2

Process	Alternative	Mode	Power Required kw	Power Required hp	Annual Cost 7/1/78 Dollars
Galvanizing					
Strip/Sheet & Miscellaneous Products	NSPS-2;PSNS-2	w/scrubbers	53	71	8200
		wo/scrubbers	42	56	6600
	NSPS-3;PSNS-3	w/scrubbers	58	78	9000
		wo/scrubbers	46	62	7200
	NSPS-4;PSNS-4	w/scrubbers	649	870	101,300
		wo/scrubbers	538	721	84,000
Wire Products & Fasteners	NSPS-2;PSNS-2	w/scrubbers	41	55	6400
		wo/scrubbers	26	35	4100
	NSPS-3;PSNS-3	w/scrubbers	44	59	6900
		wo/scrubbers	28	38	4400
	NSPS-4;PSNS-4	w/scrubbers	429	575	66,900
		wo/scrubbers	254	341	39,600
Terne Coating					
Strip/Sheet	NSPS-2;PSNS-2	w/scrubbers	27	36	4200
		wo/scrubbers	19	25	2900
	NSPS-3;PSNS-3	w/scrubbers	29	39	4500
		wo/scrubbers	20	27	3100
	NSPS-4;PSNS-4	w/scrubbers	310	416	48,400
		wo/scrubbers	224	300	34,900
Other Metal Coatings					
Strip/Sheet & Miscellaneous Products	NSPS-2;PSNS-2	w/scrubbers	41	55	6400
		wo/scrubbers	34	46	5300
	NSPS-3;PSNS-3	w/scrubbers	43	58	6700
		wo/scrubbers	36	48	5600
	NSPS-4;PSNS-4	w/scrubbers	406	544	63,400
		wo/scrubbers	313	420	48,900
Wire Products & Fasteners	NSPS-2;PSNS-2	w/scrubbers	17	23	2600
		wo/scrubbers	7	9	1100
	NSPS-3;PSNS-3	w/scrubbers	18	24	2700
		wo/scrubbers	8	11	1200
	NSPS-4;PSNS-4	w/scrubbers	91	122	14,200
		wo/scrubbers	44	59	6900

TABLE VIII-4

CONTROL AND TREATMENT TECHNOLOGY
HOT COATING SUBCATEGORY

C&TT Step		Description	Implementation Time (Months)		Land Usage (ft^2)	
Galvanizing	All Others		SSM	WPF	SSM	WPF
A	-	CHEMICAL REDUCTION - This step converts hexavalent chromium into the trivalent form, prior to precipitating it out as the the hydroxide. It is used only on that portion of rinse water containing chromate or dichromates. The reducing agent may be sulfur dioxide or sodium metabisulfite.	4 to 6	3 to 4	200	120
B	A	EQUALIZATION - This step is used to blend and equalize acidic and alkaline wastewater flows.	2 to 4	1 to 2	10,000	7,000
C	B	NEUTRALIZATION WITH LIME - A strong alkali, usually hydrated lime slurry, is added to neutralize the wastewater and precipitate dissolved metals.	8 to 12	6 to 8	500	350
D	C	FLOCCULATION WITH POLYMER - This step enhances the formation of settleable particulates from the metallic hydroxide precipitates, and gives improved TSS removal in the clarification step which follows.	3 to 4	3 to 4	100	100
E	D	SURFACE SKIMMER - Oils and greases are continuously skimmed from the surface of the equalization basin to minimize their impact on the receiving stream.	4 to 6	3 to 4	-	-
F	E	CLARIFIER - This step provides suspended solids removal via sedimentation. Also, significant reduction in total metals is achieved, since step C/B converted dissolved metals into suspended metal hydroxides.	8 to 12	8 to 12	3,000	2,600
G	F	VACUUM FILTER - Sludges which settle to the clarifier's bottom are dewatered by vacuum filtration to reduce sludge volumes and mass. Filtrates are returned to the clarifier influent trough (Last step in BPT system).	4 to 6	3 to 5	1,000	320
With Scrubbers Only						
H	G	RECYCLE - Eighty-five percent of the wastewaters from the fume scrubbers are recycled within the scrubber system, while the remaining 15 percent is blown down to the treatment sys- (Last step in BAT-1. Applies only to lines with fume scrubbers).	3 to 4	3 to 4	625	625

TABLE VIII-4
CONTROL AND TREATMENT TECHNOLOGY
HOT COATING SUBCATEGORY
PAGE 2

C&TT Step				Description	Implementation Time (Months)		Land Usage (ft^2)	
Galvanizing		All Others						
W/Scrub	No Scrub	W/Scrub	No Scrub		SSM	WPF	SSM	WPF
I	H	H	G	RINSE REDUCTION - Rinsewater flows are reduced to 25 percent of the once-through applied rate, using staged rinse steps (cascade rinsing) or reuse of rinsewaters in a counter-current fashion (last rinse is fresh water, but each preceding step uses progressively dirtier water).	4 to 6	4 to 6	775	775
J	I	I	H	FILTRATION - All effluents from clarifier (Step F/E) pass through pressure filters for further removal of TSS. Filter backwash is returned to clarifier (last step in BAT-2).	6 to 9	6 to 9	625	625
K	J	J	I	EVAPORATION AND CONDENSATION - All effluents from clarifier (omitting filtration, but including rinse reduction step) are treated in a multiple effect evaporation system which produces potable grade water and dry solids.	12 to 18	12 to 18	3,000	2,500
L	K	K	J	RECYCLE - 100 percent of all condensates from the previous step are returned to the process as makeup water. There is no buildup of dissolved solids, since these are continuously removed in the evaporation/condensation step (last step in BAT-3).	3 to 4	3 to 4	625	625

Key To Abbreviations:

C&TT - Control and Treatment Technology
SSM - Strip, sheet and miscellaneous products
WPF - Wire, wire products and fasteners

TABLE VIII-5

BPT/NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory	: Hot Coating		Model Size-TPD :	800
Subdivision	: Galvanizing, Without Fume Scrubbers		Oper. Days/Year:	260
	: Sheet/Strip/Miscellaneous		Turns/Day :	3

C&TT Steps	A	B	C	D	E	F	G	Total
Investment ($ x 10^{-3})	51.7	144.7	112.4	22.0	9.2	245.9	153.5	739.4
Annual Costs ($ x 10^{-3})								
Capital	4.7	13.0	10.1	2.0	0.8	22.1	13.8	66.5
Operation & Maintenance	1.8	5.1	3.9	0.8	0.3	8.6	5.4	25.9
Land	0.1	0.4	0.1	0.1		0.1	0.1	0.9
Sludge Disposal							6.9	6.9
Hazardous Waste Disposal								
Oil Disposal					0.4			0.4
Energy & Power	0.2	2.3	1.2	0.5	0.2	0.9	3.5	8.8
Steam								
Waste Acid								
Crystal Disposal								
Chemical	2.2		4.2	3.7				10.1
TOTAL	9.0	20.8	19.5	7.1	1.7	31.7	29.7	119.5
Credits								
Scale								
Sinter								
Oil								
Acid Recovery								
TOTAL CREDITS								
NET TOTAL	9.0	20.8	19.5	7.1	1.7	31.7	29.7	119.5

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-6

BPT/NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Hot Coating
Subdivision : Galvanizing, With Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	G	Total
Investment ($ x 10^{-3})	51.7	198.9	141.5	22.0	10.6	347.1	171.2	943.0
Annual Costs ($ x 10^{-3})								
Capital	4.7	17.9	12.7	2.0	1.0	31.2	15.4	84.9
Operation & Maintenance	1.8	7.0	5.0	0.8	0.4	12.1	6.0	33.1
Land	0.1	0.6	0.1	0.1		0.2	4.1	1.2
Sludge Disposal							8.2	8.2
Hazardous Waste Disposal								
Oil Disposal					0.5			0.5
Energy & Power	0.2	4.1	1.5	0.6	0.2	1.0	3.7	11.3
Steam								
Waste Acid								
Crystal Disposal								
Chemical	2.2		6.7	6.1				15.0
TOTAL	9.0	29.6	26.0	9.6	2.1	44.5	33.4	154.2
Credits								
Scale								
Sinter								
Oil								
Acid Recovery								
TOTAL CREDITS								
NET TOTAL	9.0	29.6	26.0	9.6	2.1	44.5	33.4	154.2

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-7

BPT/NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Hot Coating
Subdivision : Galvanizing, Without Fume Scrubbers
: Wire Products/Fasteners

Model Size-TPD : 100
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	G	Total
Investment ($ x 10^{-3})	36.5	99.2	74.2	20.0	8.4	198.2	120.9	557.4
Annual Costs ($ x 10^{-3})								
Capital	3.3	8.9	6.7	1.8	0.8	17.8	10.9	50.2
Operation & Maintenance	1.3	3.5	2.6	0.7	0.3	6.9	4.2	19.5
Land	0.1	0.2	0.1	0.1		0.1	0.1	0.7
Sludge Disposal							2.2	2.2
Hazardous Waste Disposal								
Oil Disposal					0.1			0.1
Energy & Power	0.2	2.0	0.6	0.2	0.1	0.7	2.3	6.1
Steam								
Waste Acid								
Crystal Disposal								
Chemical	1.1		2.1	1.9				5.1
TOTAL	6.0	14.6	12.1	4.7	1.3	25.5	19.7	83.9
Credits								
Scale								
Sinter								
Oil								
Acid Recovery								
TOTAL CREDITS								
NET TOTAL	6.0	14.6	12.1	4.7	1.3	25.5	19.7	83.9

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-8

BPT/NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Hot Coating
Subdivision : Galvanizing, With Fume Scrubbers
: Wire Products/Fasteners

Model Size-TPD : 100
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	G	Total
Investment ($ x 10^{-3})	36.5	153.4	119.2	22.0	9.8	257.4	126.0	724.3
Annual Costs ($ x 10^{-3})								
Capital	3.3	13.8	10.7	2.0	0.9	23.1	11.3	65.1
Operation & Maintenance	1.3	5.4	4.2	0.8	0.3	9.0	4.4	25.4
Land	0.1	0.4	0.1	0.1		0.1	0.1	0.9
Sludge Disposal							2.6	2.6
Hazardous Waste Disposal								
Oil Disposal					0.1			0.1
Energy & Power	0.2	2.9	1.4	0.5	0.2	0.9	2.6	8.7
Steam								
Waste Acid								
Crystal Disposal								
Chemical	1.1		4.6	4.2				9.9
TOTAL	6.0	22.5	21.0	7.6	1.5	33.1	21.0	112.7
Credits								
Scale								
Sinter								
Oil								
Acid Recovery								
TOTAL CREDITS								
NET TOTAL	6.0	22.5	21.0	7.6	1.5	33.1	21.0	112.7

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-9

BPT/NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Hot Coating
Subdivision : Terne, Without Fume Scrubbers
: All Products

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	93.7	69.8	20.0	8.4	187.3	97.8	477.0
Annual Costs ($ x 10^{-3})							
Capital	8.4	6.3	1.8	0.8	16.8	8.8	42.9
Operation & Maintenance	3.3	2.4	0.7	0.3	6.6	3.4	16.7
Land	0.2	0.1	0.1		0.1	0.1	0.6
Sludge Disposal						1.2	1.2
Hazardous Waste Disposal							
Oil Disposal				0.1			0.1
Energy & Power	1.9	0.6	0.2	0.1	0.6	1.4	4.8
Steam							
Waste Acid							
Crystal Disposal							
Chemical		1.9	1.9				3.8
TOTAL	13.8	11.3	4.7	1.3	24.1	14.9	70.1
Credits							
Scale							
Sinter							
Oil							
Acid Recovery							
TOTAL CREDITS							
NET TOTAL	13.8	11.3	4.7	1.3	24.1	14.9	70.1

KEY TO TREATMENT ALTERNATIVES

NSPS-1, PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-10

BPT/NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory : Hot Coating
Subdivision : Terne, With Fume Scrubbers
: All Products

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	127.0	87.3	22.0	8.4	213.8	98.8	557.3
Annual Costs ($ x 10^{-3})							
Capital	11.4	7.8	2.0	0.8	19.2	8.9	50.1
Operation & Maintenance	4.4	3.1	0.8	0.3	7.5	3.5	19.6
Land	0.3	0.1	0.1		0.1	0.1	0.7
Sludge Disposal						1.7	1.7
Hazardous Waste Disposal							
Oil Disposal				0.1			0.1
Energy & Power	2.3	0.8	0.5	0.1	0.8	1.7	6.2
Steam							
Waste Acid							
Crystal Disposal							
Chemical		3.1	2.8				5.9
TOTAL	18.4	14.9	6.2	1.3	27.6	15.9	84.3
Credits							
Scale							
Sinter							
Oil							
Acid Recovery							
TOTAL CREDITS							
NET TOTAL	18.4	14.9	6.2	1.3	27.6	15.9	84.3

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-11

BPT/NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory	: Hot Coating		Model Size-TPD	: 500
Subdivision	: Other Metals, Without Fume Scrubbers		Oper. Days/Year	: 260
	: Sheet/Strip/Miscellaneous		Turns/Day	: 2

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	113.1	77.8	20.0	8.4	213.8	138.2	571.3
Annual Costs ($ x 10^{-3})							
Capital	10.2	7.0	1.8	0.8	19.2	12.4	51.4
Operation & Maintenance	4.0	2.7	0.7	0.3	7.5	4.8	20.0
Land	0.2	0.1	0.1		0.1	0.1	0.6
Sludge Disposal						4.8	4.8
Hazardous Waste Disposal							
Oil Disposal				0.3			0.3
Energy & Power	2.1	0.7	0.3	0.1	0.8	3.5	7.5
Steam							
Waste Acid							
Crystal Disposal							
Chemical		2.6	2.3				4.9
TOTAL	16.5	13.1	5.2	1.5	27.6	25.6	89.5
Credits							
Scale							
Sinter							
Oil							
Acid Recovery							
TOTAL CREDITS							
NET TOTAL	16.5	13.1	5.2	1.5	27.6	25.6	89.5

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-12

BPT/NSPS/PSNS TREATMENT MODEL COST: BASIS 7/1/78 DOLLARS

Subcategory : Hot Coating
Subdivision : Other Metals, With Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size (TPD): 500
Oper. Days/Year : 260
Turns/Day : 2

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	143.2	97.1	22.0	8.4	235.7	153.5	659.9
Annual Costs ($ x 10^{-3})							
Capital	12.9	8.7	2.0	0.8	21.2	13.8	59.4
Operation & Maintenance	5.0	3.4	0.8	0.3	8.2	5.4	23.1
Land	0.3	0.1	0.1		0.1	0.1	0.7
Sludge Disposal						6.1	6.1
Hazardous Waste Disposal							
Oil Disposal				0.5			0.5
Energy & Power	2.3	1.0	0.5	0.1	0.9	3.5	8.3
Steam							
Waste Acid							
Crystal Disposal							
Chemical		3.8	3.7				7.5
TOTAL	20.5	17.0	7.1	1.7	30.4	28.9	105.6
Credits							
Scale							
Sinter							
Oil							
Acid Recovery							
TOTAL CREDITS							
NET TOTAL	20.5	17.0	7.1	1.7	30.4	28.9	105.6

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-13

BPT/NSPS/PSNS TREATMENT MODEL COST: BASIS 7/1/78 DOLLARS

Subcategory : Hot Coating
Subdivision : Other Metals, Without Fume Scrubbers
: Wire Products/Fasteners

Model Size (TPD): 15
Oper. Days/Year : 260
Turns/Day : 2

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	37.6	29.2	20.0	5.3	74.2	59.0	225.3
Annual Costs ($ x 10^{-3})							
Capital	3.4	2.6	1.8	0.5	6.7	5.3	20.3
Operation & Maintenance	1.3	1.0	0.7	0.2	2.6	2.1	7.9
Land	0.1	0.1	0.1		0.1	0.1	0.5
Sludge Disposal						0.4	0.4
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	0.5	0.3	0.1	0.1	0.2	0.3	1.5
Steam							
Waste Acid							
Crystal Disposal							
Chemical		0.3	0.5				0.8
TOTAL	5.3	4.3	3.2	0.8	9.6	8.2	31.4
Credits							
Scale							
Sinter							
Oil							
Acid Recovery							
TOTAL CREDITS							
NET TOTAL	5.3	4.3	3.2	0.8	9.6	8.2	31.4

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-14

BPT/NSPS/PSNS TREATMENT MODEL COST: BASIS 7/1/78 DOLLARS

Subcategory	: Hot Coating	Model Size (TPD):	15
Subdivision	: Other Metals, With Fume Scrubbers	Oper. Days/Year :	260
	: Wire Products/Fasteners	Turns/Day :	2

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	80.5	62.5	20.0	8.4	150.5	82.3	404.2
Annual Costs ($ x 10^{-3})							
Capital	7.2	5.6	1.8	0.8	13.5	7.4	36.3
Operation & Maintenance	2.8	2.2	0.7	0.3	5.3	2.9	14.2
Land	0.1	0.1	0.1		0.1	0.1	0.5
Sludge Disposal						0.5	0.5
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	1.5	0.6	0.2	0.1	0.3	0.7	3.4
Steam							
Waste Acid							
Crystal Disposal							
Chemical		1.6	1.4				3.0
TOTAL	11.6	10.1	4.2	1.2	19.2	11.6	57.9
Credits							
Scale							
Sinter							
Oil							
Acid Recovery							
TOTAL CREDITS							
NET TOTAL	11.6	10.1	4.2	1.2	19.2	11.6	57.9

KEY TO TREATMENT ALTERNATIVES

NSPS-1,PSNS-1 = BPT

KEY TO C&TT STEPS

A: Chemical Reduction
B: Equalization
C: Neutralization With Lime
D: Flocculation With Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration

TABLE VIII-15

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Galvanizing, Without Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

		BAT	BAT Alternative 2			BAT Alternative 3			
C&TT Step	Total BPT	Alt. 1	H	I	Total	H	J	K	Total
Investment ($ x 10^{-3})	739.4	(1)	288.0	119.9	407.9	288.0	2,276.7	28.5	2,593.2
Annual Costs ($ x 10^{-3})									
Capital	66.5		25.9	10.8	36.7	25.9	204.7	2.6	233.2
Operation & Maintenance	25.9		10.1	4.2	14.3	10.1	79.7	1.0	90.8
Land	0.9		0.1	0.1	0.2	0.1	0.1	0.1	0.3
Sludge Disposal	6.9								
Hazardous Waste Disposal									
Oil Disposal	0.4								
Energy & Power	8.8			0.6	0.6		77.4		77.4
Steam									
Waste Acid									
Crystal Disposal									
Chemical	10.1								
TOTAL	119.5		36.1	15.7	51.8	36.1	361.9	3.7	401.7
Credits									
Scale									
Sinter									
Oil									
Acid Recovery									
TOTAL CREDITS									
NET TOTAL	119.5		36.1	15.7	51.8	36.1	361.9	3.7	401.7

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(1) Since the BAT-1 treatment component is fume scrubber recycle, it does not apply to those models without fume scrubbers.

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

H: Rinse Reduction
I: Pressure Filtration
J: Vapor Compression Distillation
K: Recycle

TABLE VIII-16

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Galvanizing, With Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size - TPD: 800
Oper. Days/Year : 260
Turns/Day : 3

	Total	BAT Alt. 1		BAT Alternative 2 Alternative 1 Plus:			BAT Alternative 3 Alternative 1 Plus:			
C&TT Step	BPT	H	Total	I	J	Total	I	K	L	Total
Investment ($ x 10^{-3})	943.0	59.1	59.1	288.0	144.3	491.4	288.0	2,473.1	43.5	2,863.7
Annual Costs ($ x 10^{-3})										
Capital	84.9	5.3	5.3	25.9	13.0	44.2	25.9	222.3	3.9	257.4
Operation & Maintenance	33.1	2.1	2.1	10.1	5.0	17.2	10.1	86.6	1.5	100.3
Land	1.2	0.1	0.1	0.1	0.1	0.3	0.1	0.2	0.1	0.5
Sludge Disposal	8.2									
Hazardous Waste Disposal										
Oil Disposal	0.5									
Energy & Power	11.3	0.8	0.8		0.8	1.6		93.1		93.9
Steam										
Waste Acid										
Crystal Disposal										
Chemical	15.0									
TOTAL	154.2	8.3	8.3	36.1	18.9	63.3	36.1	402.2	5.5	452.1
Credits										
Scale										
Sinter										
Oil										
Acid Recovery										
TOTAL CREDITS										
NET TOTAL	154.2	8.3	8.3	36.1	18.9	63.3	36.1	402.2	5.5	452.1

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

H: Recycle
I: Rinse Reduction
J: Pressure Filtration
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-17

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory:	Hot Coating	Model Size-TPD :	100
Subdivision:	Galvanizing, Without Fume Scrubbers	Oper. Days/Year:	260
:	Wire Products/Fasteners	Turns/Day :	3

C&TT Step	Total BPT	BAT Alt. 1	BAT Alternative 2			BAT Alternative 3			
			H	I	Total	H	J	K	Total
Investment ($ x 10^{-3})	557.4	(1)	36.0	49.5	85.5	36.0	1,920.3	25.5	1,981.8
Annual Costs ($ x 10^{-3})									
Capital	50.2		3.2	4.4	7.6	3.2	172.6	2.3	178.1
Operation & Maintenance	19.5		1.3	1.7	3.0	1.3	67.2	0.9	69.4
Land	0.7		0.1	0.1	0.2	0.1	0.1	0.1	0.3
Sludge Disposal	2.2								
Hazardous Waste Disposal									
Oil Disposal	0.1								
Energy & Power	6.1			0.3	0.3		35.5		35.5
Steam									
Waste Acid									
Crystal Disposal									
Chemical	5.1								
TOTAL	83.9		4.6	6.5	11.1	4.6	275.4	3.3	283.3
Credits									
Scale									
Sinter									
Oil									
Acid Recovery									
TOTAL CREDITS									
NET TOTAL	83.9		4.6	6.5	11.1	4.6	275.4	3.3	283.3

---

(1) Since the BAT-1 treatment component is fume scrubber recycle, it does not apply to those models without fume scrubbers.

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

H: Rinse Reduction
I: Pressure Filtration
J: Vapor Compression Distillation
K: Recycle

TABLE VIII-18

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Galvanizing, With Fume Scrubbers
: Wire Products/Fasteners

Model Size - TPD: 100
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alt. 1		BAT Alternative 2 Alternative 1 Plus:			BAT Alternative 3 Alternative 1 Plus:			
		H	Total	I	J	Total	I	K	L	Total
Investment ($ x 10^{-3})	724.3	59.1	59.1	36.0	110.1	205.2	36.0	2,242.0	26.2	2,363.3
Annual Costs ($ x 10^{-3})										
Capital	65.1	5.3	5.3	3.2	9.9	18.4	3.2	201.6	2.4	212.5
Operation & Maintenance	25.4	2.1	2.1	1.3	3.9	7.3	1.3	78.5	0.9	82.8
Land	0.9	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.4
Sludge Disposal	2.6									
Hazardous Waste Disposal										
Oil Disposal	0.1									
Energy & Power	8.7	0.8	0.8		0.5	1.3		60.5		61.3
Steam										
Waste Acid										
Crystal Disposal										
Chemical	9.9									
TOTAL	112.7	8.3	8.3	4.6	14.4	27.3	4.6	340.7	3.4	357.0
Credits										
Scale										
Sinter										
Oil										
Acid Recovery										
TOTAL CREDITS										
NET TOTAL	112.7	8.3	8.3	4.6	14.4	27.3	4.6	340.7	3.4	357.0

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

H: Recycle
I: Rinse Reduction
J: Pressure Filtration
K: Vapor Compression Distillation
L: Recycle

TABLE VIII-19

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Terne, Without Fume Scrubbers
: All Products

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alt. 1	BAT Alternative 2 H	BAT Alternative 2 I	BAT Alternative 2 Total	BAT Alternative 3 G	BAT Alternative 3 I	BAT Alternative 3 J	BAT Alternative 3 Total
Investment ($ x 10^{-3})	477.0	(1)	131.0	46.6	177.6	131.0	1,873.7	25.5	2,030.2
Annual Costs ($ x 10^{-3})									
Capital	42.9		11.8	4.2	16.0	11.8	168.4	2.3	182.5
Operation & Maintenance	16.7		4.6	1.6	6.2	4.6	65.6	0.9	71.1
Land	0.6		0.1	0.1	0.2	0.1	0.1	0.1	0.3
Sludge Disposal	1.2								
Hazardous Waste Disposal									
Oil Disposal	0.1								
Energy & Power	4.8			0.2	0.2		32.0		32.0
Steam									
Waste Acid									
Crystal Disposal									
Chemical	3.8								
TOTAL	70.1		16.5	6.1	22.6	16.5	266.1	3.3	285.9
Credits									
Scale									
Sinter									
Oil									
Acid Recovery									
TOTAL CREDITS									
NET TOTAL	70.1		16.5	6.1	22.6	16.5	266.1	3.3	285.9

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(1) Since the BAT-1 treatment component is fume scrubber recycle, it does not apply to those models without fume scrubbers.

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

H: Rinse Reduction
I: Pressure Filtration
J: Vapor Compression Distillation
K: Recycle

TABLE VIII-20

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Terne, With Fume Scrubbers
: All Products

Model Size - TPD: 365
Oper. Days/Year : 260
Turns/Day : 3

	Total	BAT Alt. 1		BAT Alternative 2 Alternative 1 Plus:			BAT Alternative 3 Alternative 1 Plus:			
C&TT Step	BPT	G	Total	H	I	Total	H	J	K	Total
Investment ($ x 10^{-3})	557.3	53.8	53.8	131.0	56.9	241.7	131.0	2,049.8	25.5	2,260.1
Annual Costs ($ x 10^{-3})										
Capital	50.1	4.8	4.8	11.8	5.1	21.7	11.8	184.3	2.3	203.2
Operation & Maintenance	19.6	1.9	1.9	4.6	2.0	8.5	4.6	71.7	0.9	79.1
Land	0.7	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.4
Sludge Disposal	1.7									
Hazardous Waste Disposal										
Oil Disposal	0.1									
Energy & Power	6.2	0.6	0.6		0.3	0.9		44.2		44.8
Steam										
Waste Acid										
Crystal Disposal										
Chemical	5.9									
TOTAL	84.3	7.4	7.4	16.5	7.5	31.4	16.5	300.3	3.3	327.5
Credits										
Scale										
Sinter										
Oil										
Acid Recovery										
TOTAL CREDITS										
NET TOTAL	84.3	7.4	7.4	16.5	7.5	31.4	16.5	300.3	3.3	327.5

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

G: Recycle
H: Rinse Reduction
I: Pressure Filtration
J: Vapor Compression Distillation
K: Recycle

TABLE VIII-21

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Other Metals, Without Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 2

C&TT Step	Total BPT	BAT Alt. 1	BAT Alternative 2			BAT Alternative 3			
			G	H	Total	G	I	J	Total
Investment ($ x 10^{-3})	571.3	(1)	180.0	56.2	236.2	180.0	2,026.5	25.5	2,232.0
Annual Costs ($ x 10^{-3})									
Capital	51.4		16.2	5.1	21.3	16.2	182.2	2.3	200.7
Operation & Maintenance	20.0		6.3	2.0	8.3	6.3	70.9	0.9	78.1
Land	0.6		0.1	0.1	0.2	0.1	0.1	0.1	0.3
Sludge Disposal	4.8								
Hazardous Waste Disposal									
Oil Disposal	0.3								
Energy & Power	7.5			0.3	0.3		43.6		43.6
Steam									
Waste Acid									
Crystal Disposal									
Chemical	4.9								
TOTAL	89.5		22.6	7.5	30.1	22.6	296.8	3.3	322.7
Credits									
Scale									
Sinter									
Oil									
Acid Recovery									
TOTAL CREDITS									
NET TOTAL	89.5		22.6	7.5	30.1	22.6	296.8	3.3	322.7

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(1) Since the BAT-1 treatment component is fume scrubber recycle, it does not apply to those models without fume scrubbers.

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

G: Rinse Reduction
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-22

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Other Metals, With Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size - TPD: 500
Oper. Days/Year : 260
Turns/Day : 2

C&TT Step	Total	BAT Alt. 1		BAT Alternative 2 Alternative 1 Plus:			BAT Alternative 3 Alternative 1 Plus:			
	BPT	G	Total	H	I	Total	H	J	K	Total
Investment ($ x 10^{-3})	659.9	53.8	53.8	180.0	105.4	339.2	180.0	2,345.5	25.5	2,604.8
Annual Costs ($ x 10^{-3})										
Capital	59.4	4.8	4.8	16.2	9.5	30.5	16.2	210.9	2.3	234.2
Operation & Maintenance	23.1	1.9	1.9	6.3	3.7	11.9	6.3	82.1	0.9	91.2
Land	0.7	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.4
Sludge Disposal	6.1									
Hazardous Waste Disposal										
Oil Disposal	0.5									
Energy & Power	8.3	0.6	0.6		0.3	0.9		57.0		57.6
Steam										
Waste Acid										
Crystal Disposal										
Chemical	7.5									
TOTAL	105.6	7.4	7.4	22.6	13.6	43.6	22.6	350.1	3.3	383.4
Credits										
Scale										
Sinter										
Oil										
Acid Recovery										
TOTAL CREDITS										
NET TOTAL	105.6	7.4	7.4	22.6	13.6	43.6	22.6	350.1	3.3	383.4

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

G: Recycle
H: Rinse Reduction
I: Pressure Filtration
J: Vapor Compression Distillation
K: Recycle

TABLE VIII-23

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Other Metals, Without Fume Scrubbers
: Wire Products/Fasteners

Model Size-TPD : 15
Oper. Days/Year: 260
Turns/Day : 2

C&TT Step	Total BPT	BAT Alt. 1	BAT Alternative 2			BAT Alternative 3			
			G	H	Total	G	I	J	Total
Investment ($ x 10^{-3})	225.3	(1)	5.4	15.4	20.8	5.4	1,024.3	15.1	1,044.8
Annual Costs ($ x 10^{-3})									
Capital	20.3		0.5	1.4	1.9	0.5	92.1	1.4	94.0
Operation & Maintenance	7.9		0.2	0.5	0.7	0.2	35.9	0.5	36.6
Land	0.5		0.1	0.1	0.2	0.1	0.1	0.1	0.3
Sludge Disposal	0.4								
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power	1.5			0.1	0.1		5.8		5.8
Steam									
Waste Acid									
Crystal Disposal									
Chemical	0.8								
TOTAL	31.4		0.8	2.1	2.9	0.8	133.9	2.0	136.7
Credits									
Scale									
Sinter									
Oil									
Acid Recovery									
TOTAL CREDITS									
NET TOTAL	31.4		0.8	2.1	2.9	0.8	133.9	2.0	136.7

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(1) Since the BAT-1 treatment component is fume scrubber recycle, it does not apply to those models without fume scrubbers.

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

G: Rinse Reduction
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-24

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating — Model Size - TPD: 15
Subdivision: Other Metals, With Fume Scrubbers — Oper. Days/Year : 260
: Wire Products/Fasteners — Turns/Day : 2

		BAT		BAT Alternative 2			BAT Alternative 3			
	Total	Alt. 1		Alternative 1 Plus:			Alternative 1 Plus:			
C&TT Step	BPT	G	Total	H	I	Total	H	J	K	Total
Investment ($ x 10^{-3})	404.2	53.8	53.8	5.4	32.6	91.8	5.4	1,454.8	24.0	1,538.0
Annual Costs ($ x 10^{-3})										
Capital	36.3	4.8	4.8	0.5	2.9	8.2	0.5	130.8	2.2	138.3
Operation & Maintenance	14.2	1.9	1.9	0.2	1.1	3.2	0.2	50.9	0.8	53.8
Land	0.5	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.4
Sludge Disposal	0.5									
Hazardous Waste Disposal										
Oil Disposal										
Energy & Power	3.4	0.6	0.6		0.1	0.7		11.6		12.2
Steam										
Waste Acid										
Crystal Disposal										
Chemical	3.0									
TOTAL	57.9	7.4	7.4	0.8	4.2	12.4	0.8	193.4	3.1	204.7
Credits										
Scale										
Sinter										
Oil										
Acid Recovery										
TOTAL CREDITS										
NET TOTAL	57.9	7.4	7.4	0.8	4.2	12.4	0.8	193.4	3.1	204.7

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2
PSES-4 = BPT + BAT-3

KEY TO C&TT STEPS

G: Recycle
H: Rinse Reduction
I: Pressure Filtration
J: Vapor Compression Distillation
K: Recycle

TABLE VIII-25

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Galvanizing, Without Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size - TPD: 800
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total NSPS/PSNS Alt. 1	NSPS/PSNS Alternative 2									NSPS/PSNS Alternative 3 Alt. 2 Plus:		NSPS/PSNS Alternative 4 Alt. 2 Plus:		
		A	B	C	D	E	F	G	H	Total	I	Total	J	K	Total
Investment ($ x 10^{-3})	739.4	51.7	288.0	63.0	112.4	20.0	8.4	125.1	153.5	822.1	119.9	942.0	2,276.7	28.5	3,127.3
Annual Costs ($ x 10^{-3})															
Capital	66.5	4.7	25.9	5.7	10.1	1.8	0.8	11.2	13.8	74.0	10.8	84.8	204.7	2.6	281.3
Operation & Maintenance	25.9	1.8	10.1	2.2	3.9	0.7	0.3	4.4	5.4	28.8	4.2	33.0	79.7	1.0	109.5
Land	0.9	0.1	0.1	0.1	0.1	0.1		0.1	0.1	0.7	0.1	0.8	0.1	0.1	0.9
Sludge Disposal	6.9								6.9	6.9		6.9			6.9
Hazardous Waste Disposal															
Oil Disposal	0.4						0.4			0.4		0.4			0.4
Energy & Power	8.8	0.2		1.2	1.2	0.1	0.1	0.3	3.5	6.6	0.6	7.2	77.4		84.0
Steam															
Waste Acid															
Crystal Disposal															
Chemical	10.1	2.2			4.2	3.7				10.1		10.1			10.1
TOTAL	119.5	9.0	36.1	9.2	19.5	6.4	1.6	16.0	29.7	127.5	15.7	143.2	361.9	3.7	493.1
Credits															
Scale															
Sinter															
Oil															
Acid Recovery															
TOTAL CREDITS															
NET TOTAL	119.5	9.0	36.1	9.2	19.5	6.4	1.6	16.0	29.7	127.5	15.7	143.2	361.9	3.7	493.1

KEY TO C&TT STEPS

A:	Chemical Reduction	E:	Flocculation with Polymer	I:	Pressure Filtration
B:	Rinse Reduction	F:	Surface Skimming	J:	Vapor Compression Distillation
C:	Equalization	G:	Clarification	K:	Recycle
D:	Neutralization with Lime	H:	Vacuum Filtration		

NOTE: Refer to Table VIII-5 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-26

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Galvanizing, With Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size - TPD: 800
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total NSPS/PSNS Alt. 1	NSPS/PSNS Alternative 2										NSPS/PSNS Alternative 3 Alt. 2 Plus:		NSPS/PSNS Alternative 4 Alt. 2 Plus:		
		A	B	C	D	E	F	G	H	I	Total	J	Total	K	L	Total
Investment ($ x 10^{-3})	943.0	57.1	59.1	288.0	75.8	141.5	20.0	8.4	134.9	171.2	950.6	144.3	1,094.9	2,473.1	43.5	3,467.2
Annual Costs ($ x 10^{-3})																
Capital	84.9	4.7	5.3	25.9	6.8	12.7	1.8	0.8	12.1	15.4	85.5	13.0	98.5	222.3	3.9	311.7
Operation & Maintenance	33.1	1.8	2.1	10.1	2.7	5.0	0.7	0.3	4.7	6.0	33.4	5.0	38.4	86.6	1.5	121.5
Land	1.2	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.7	0.1	0.8	0.2	0.1	1.0
Sludge Disposal	8.2															
Hazardous Waste Disposal										8.2	8.2		8.2			8.2
Oil Disposal	0.5							0.5			0.5		0.5			0.5
Energy & Power	11.3	0.2	0.8		1.4	1.5	0.2	0.1	0.3	3.7	8.2	0.8	9.0	93.1		101.3
Steam																
Waste Acid Crystal Disposal																
Chemical	15.0	2.2				6.7	6.1				15.0		15.0			15.0
TOTAL	154.2	9.0	8.2	36.1	11.0	26.0	8.9	1.7	17.2	33.4	151.5	18.9	170.4	402.2	5.5	559.2
Credits																
Scale																
Sinter																
Oil																
Acid Recovery																
TOTAL CREDITS																
NET TOTAL	154.2	9.0	8.2	36.1	11.0	26.0	8.9	1.7	17.2	33.4	151.5	18.9	170.4	402.2	5.5	559.2

KEY TO C&TT STEPS

A: Chemical Reduction
B: Fume Scrubber Recycle
C: Rinse Reduction
D: Equalization
E: Neutralization with Lime
F: Flocculation with Polymer
G: Surface Skimming
H: Clarification
I: Vacuum Filtration
J: Pressure Filtration
K: Vapor Compression Distillation
L: Recycle

NOTE: Refer to Table VIII-6 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-27

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Galvanizing, Without Fume Scrubbers
: Wire Products/Fasteners

Model Size - TPD: 100
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total NSPS/PSNS Alt. 1	NSPS/PSNS Alternative 2 A	B	C	D	E	F	G	H	Total	NSPS/PSNS Alternative 3 Alt. 2 Plus: I	Total	NSPS/PSNS Alternative 4 Alt. 2 Plus: J	K	Total
Investment ($ x 10^{-3})	557.4	36.5	36.0	39.9	74.2	20.0	6.1	87.8	120.9	421.4	49.5	470.9	1,920.3	25.5	2,367.2
Annual Costs ($ x 10^{-3})															
Capital	50.2	3.3	3.2	3.6	6.7	1.8	0.6	7.9	10.9	38.0	4.4	42.4	172.6	2.3	212.9
Operation & Maintenance	19.5	1.3	1.3	1.4	2.6	0.7	0.2	3.1	4.2	14.8	1.7	16.5	67.2	0.9	82.9
Land	0.7	0.1	0.1	0.1	0.1	0.1		0.1	0.1	0.7	0.1	0.8	0.1	0.1	0.9
Sludge Disposal	2.2								2.2	2.2		2.2			2.2
Hazardous Waste Disposal															
Oil Disposal	0.1						0.1			0.1		0.1			0.1
Energy & Power	6.1	0.2		0.6	0.6	0.1	0.1	0.2	2.3	4.1	0.3	4.4	35.5		39.6
Steam															
Waste Acid Crystal Disposal															
Chemical	5.1	1.1			2.1	1.9				5.1		5.1			5.1
TOTAL	83.9	6.0	4.6	5.7	12.1	4.6	1.0	11.3	19.7	65.0	6.5	71.5	275.4	3.3	343.7
Credits															
Scale															
Sinter															
Oil															
Acid Recovery															
TOTAL CREDITS															
NET TOTAL	83.9	6.0	4.6	5.7	12.1	4.6	1.0	11.3	19.7	65.0	6.5	71.5	275.4	3.3	343.7

KEY TO C&TT STEPS

A:	Chemical Reduction	E:	Flocculation with Polymer	H:	Vacuum Filtration
B:	Rinse Reduction	F:	Surface Skimming	I:	Pressure Filtration
C:	Equalization	G:	Clarification	J:	Vapor Compression Distillation
D:	Neutralization with Lime			K:	Recycle

NOTE: Refer to Table VIII-7 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-28

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory:	Hot Coating	Model Size - TPD:	100
Subdivision:	Galvanizing, With Fume Scrubbers	Oper. Days/Year :	260
:	Wire Products/Fasteners	Turns/Day :	3

C&TT Step	Total NSPS/PSNS Alt. 1	NSPS/PSNS Alternative 2										NSPS/PSNS Alternative 3 Alt. 2 Plus:		NSPS/PSNS Alternative 4 Alt. 2 Plus:		
		A	B	C	D	E	F	G	H	I	Total	J	Total	K	L	Total
Investment ($ x 10^-3)	724.3	36.5	59.1	36.0	60.2	119.2	20.0	8.4	118.0	126.0	583.4	110.1	693.5	2,242.0	26.2	2,851.6
Annual Costs ($ x 10^-3)																
Capital	65.1	3.3	5.3	3.2	5.4	10.7	1.8	0.8	10.6	11.3	52.4	9.9	62.3	201.6	2.4	256.4
Operation & Maintenance	25.4	1.3	2.1	1.3	2.1	4.2	0.7	0.3	4.1	4.4	20.5	3.9	24.4	78.5	0.9	99.9
Land	0.9	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.7	0.1	0.8	0.1	0.1	0.9
Sludge Disposal	2.6									2.6	2.6		2.6			2.6
Hazardous Waste Disposal																
Oil Disposal	0.1							0.1			0.1		0.1			0.1
Energy & Power	8.7	0.2	0.8		0.9	1.4	0.1	0.1	0.3	2.6	6.4	0.5	6.9	60.5		66.9
Steam																
Waste Acid Crystal Disposal																
Chemical	9.9	1.1				4.6	4.2				9.9		9.9			9.9
TOTAL	112.7	6.0	8.2	4.6	8.5	21.0	6.9	1.3	15.1	21.0	92.6	14.4	107.0	340.7	3.4	436.7
Credits																
Scale																
Sinter																
Oil																
Acid Recovery																
TOTAL CREDITS																
NET TOTAL	112.7	6.0	8.2	4.6	8.5	21.0	6.9	1.3	15.1	21.0	92.6	14.4	107.0	340.7	3.4	436.7

KEY TO C&TT STEPS

A:	Chemical Reduction	E:	Neutralization with Lime	H:	Clarification
B:	Fume Scrubber Recycle	F:	Flocculation with Polymer	I:	Vacuum Filtration
C:	Rinse Reduction	G:	Surface Skimming	J:	Pressure Filtration
D:	Equalization			K:	Vapor Compression Distillation
				L:	Recycle

NOTE: Refer to Table VIII-8 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-29

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Terne, Without Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size - TPD: 365
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total NSPS/PSNS Alt. 1	NSPS/PSNS Alternative 2								NSPS/PSNS Alternative 3 Alt. 2 Plus:		NSPS/PSNS Alternative 4 Alt. 2 Plus:		
		A	B	C	D	E	F	G	Total	H	Total	I	J	Total
Investment ($ x 10^-3)	477.0	131.0	39.9	69.8	20.0	5.8	87.8	97.8	452.1	46.6	498.7	1,873.7	25.5	2,351.3
Annual Costs ($ x 10^-3)														
Capital	42.9	11.8	3.6	6.3	1.8	0.5	7.9	8.8	40.7	4.2	44.9	168.4	2.3	211.4
Operation & Maintenance	16.7	4.6	1.4	2.4	0.7	0.2	3.1	3.4	15.8	1.6	17.4	65.6	0.9	82.3
Land	0.6	0.1	0.1	0.1	0.1		0.1	0.1	0.6	0.1	0.7	0.1	0.1	0.8
Sludge Disposal	1.2							1.2	1.2		1.2			1.2
Hazardous Waste Disposal														
Oil Disposal	0.1					0.1			0.1		0.1			0.1
Energy & Power	4.8		0.5	0.6	0.1	0.1	0.2	1.4	2.9	0.2	3.1	32.0		34.9
Steam														
Waste Acid														
Crystal Disposal														
Chemical	3.8			1.9	1.9				3.8		3.8			3.8
TOTAL	70.1	16.5	5.6	11.3	4.6	0.9	11.3	14.9	65.1	6.1	71.2	266.1	3.3	334.5
Credits														
Scale														
Sinter														
Oil														
Acid Recovery														
TOTAL CREDITS														
NET TOTAL	70.1	16.5	5.6	11.3	4.6	0.9	11.3	14.9	65.1	6.1	71.2	266.1	3.3	334.5

KEY TO C&TT STEPS

A: Rinse Reduction
B: Equalization
C: Neutralization with Lime
D: Flocculation with Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

NOTE: Refer to Table VIII-9 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-30

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory:	Hot Coating	Model Size - TPD:	365
Subdivision:	Terne, With Fume Scrubbers	Oper. Days/Year :	260
:	Sheet/Strip/Miscellaneous	Turns/Day :	3

	Total NSPS/PSNS	NSPS/PSNS Alternative 2									NSPS/PSNS Alternative 3 Alt. 2 Plus:		NSPS/PSNS Alternative 4 Alt. 2 Plus:		
C&TT Step	Alt. 1	A	B	C	D	E	F	G	H	Total	I	Total	J	K	Total
Investment ($ x 10^{-3})	557.3	53.8	131.0	45.9	87.3	20.0	7.0	101.0	98.8	544.8	56.9	601.7	2,049.8	25.5	2,620.1
Annual Costs ($ x 10^{-3})															
Capital	50.1	4.8	11.8	4.1	7.8	1.8	0.6	9.1	8.9	48.9	5.1	54.0	184.3	2.3	235.5
Operation & Maintenance	19.6	1.9	4.6	1.6	3.1	0.7	0.2	3.5	3.5	19.1	2.0	21.1	71.7	0.9	91.7
Land	0.7		0.1	0.1	0.1	0.1		0.1	0.1	0.6	0.1	0.7	0.1	0.1	0.8
Sludge Disposal	1.7								1.7	1.7		1.7			1.7
Hazardous Waste Disposal															
Oil Disposal	0.1						0.1			0.1		0.1			
Energy & Power	6.2	0.6		0.7	0.8	0.1	0.1	0.2	1.7	4.2	0.3	4.5	44.2		48.4
Steam															
Waste Acid Crystal Disposal															
Chemical	5.9				3.1	2.8				5.9		5.9			5.9
TOTAL	84.3	7.3	16.5	6.5	14.9	5.5	1.0	12.9	15.9	80.5	7.5	88.0	300.3	3.3	384.1
Credits															
Scale															
Sinter															
Oil															
Acid Recovery															
TOTAL CREDITS															
NET TOTAL	84.3	7.3	16.5	6.5	14.9	5.5	1.0	12.9	15.9	80.5	7.5	88.0	300.3	3.3	384.1

KEY TO C&TT STEPS

A: Fume Scrubber Recycle
B: Rinse Reduction
C: Equalization
D: Neutralization with Lime
E: Flocculation with Polymer
F: Surface Skimming
G: Clarification
H: Vacuum Filtration
I: Pressure Filtration
J: Vapor Compression Distillation
K: Recycle

NOTE: Refer to Table VIII-10 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-31

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Other Metals, Without Fume Scrubbers
: Sheet/Strip/Miscellaneous

Model Size - TPD: 500
Oper. Days/Year : 260
Turns/Day : 2

C&TT Step	Total NSPS/PSNS Alt. 1	NSPS/PSNS Alternative 2								NSPS/PSNS Alternative 3 Alt. 2 Plus:		NSPS/PSNS Alternative 4 Alt. 2 Plus:		
		A	B	C	D	E	F	G	Total	H	Total	I	J	Total
Investment ($ x 10^{-3})	571.3	180.0	45.4	77.8	20.0	7.0	99.8	138.2	568.2	56.2	624.4	2,026.5	25.5	2,620.2
Annual Costs ($ x 10^{-3})														
Capital	51.4	16.2	4.1	7.0	1.8	0.6	9.0	12.4	51.1	5.1	56.2	182.2	2.3	235.6
Operation & Maintenance	20.0	6.3	1.6	2.7	0.7	0.2	3.5	4.8	19.8	2.0	21.8	70.9	0.9	91.6
Land	0.6	0.1	0.1	0.1	0.1		0.1	0.1	0.6	0.1	0.7	0.1	0.1	0.8
Sludge Disposal	4.8							4.8	4.8		4.8			4.8
Hazardous Waste Disposal														
Oil Disposal	0.3					0.3			0.3		0.3			0.3
Energy & Power	7.5		0.7	0.7	0.1	0.1	0.2	3.5	5.3	0.3	5.6	43.6		48.9
Steam														
Waste Acid														
Crystal Disposal														
Chemical	4.9			2.6	2.3				4.9		4.9			4.9
TOTAL	89.5	22.6	6.5	13.1	5.0	1.2	12.8	25.6	86.8	7.5	94.3	296.8	3.3	386.9
Credits														
Scale														
Sinter														
Oil														
Acid Recovery														
TOTAL CREDITS														
NET TOTAL	89.5	22.6	6.5	13.1	5.0	1.2	12.8	25.6	86.8	7.5	94.3	296.8	3.3	386.9

KEY TO C&TT STEPS

A: Rinse Reduction
B: Equalization
C: Neutralization with Lime
D: Flocculation with Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

NOTE: Refer to Table VIII-11 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-32

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory:	Hot Coating	Model Size - TPD:	500
Subdivision:	Other Metals, With Fume Scrubbers	Oper. Days/Year :	260
:	Sheet/Strip/Miscellaneous	Turns/Day :	2

C&TT Step	Total NSPS/PSNS Alt. 1	NSPS/PSNS Alternative 2 A	B	C	D	E	F	G	H	Total	NSPS/PSNS Alternative 3 Alt. 2 Plus: I	Total	NSPS/PSNS Alternative 4 Alt. 2 Plus: J	K	Total
Investment ($ x 10^{-3})	659.9	53.8	180.0	57.7	97.1	20.0	8.1	114.0	153.5	684.2	105.4	789.6	2,345.5	25.5	3,055.2
Annual Costs ($ x 10^{-3})															
Capital	59.4	4.8	16.2	5.2	8.7	1.8	0.7	10.2	13.8	61.4	9.5	70.9	210.9	2.3	274.6
Operation & Maintenance	23.1	1.9	6.3	2.0	3.4	0.7	0.3	4.0	5.4	24.0	3.7	27.7	82.1	0.9	107.0
Land	0.7		0.1	0.1	0.1	0.1		0.1	0.1	0.6	0.1	0.7	0.1	0.1	0.8
Sludge Disposal	6.1								6.1	6.1		6.1			6.1
Hazardous Waste Disposal															
Oil Disposal	0.5						0.5			0.5		0.5			0.5
Energy & Power	8.3	0.6		0.8	1.0	0.1	0.1	0.3	3.5	6.4	0.3	6.7	57.0		63.4
Steam															
Waste Acid															
Crystal Disposal															
Chemical	7.5				3.8	3.7				7.5		7.5			7.5
TOTAL	105.6	7.3	22.6	8.1	17.0	6.4	1.6	14.6	28.9	106.5	13.6	120.1	350.1	3.3	459.9
Credits															
Scale															
Sinter															
Oil															
Acid Recovery															
TOTAL CREDITS															
NET TOTAL	105.6	7.3	22.6	8.1	17.0	6.4	1.6	14.6	28.9	106.5	13.6	120.1	350.1	3.3	459.9

KEY TO C&TT STEPS

A:	Fume Scrubber Recycle	E:	Flocculation with Polymer	H:	Vacuum Filtration
B:	Rinse Reduction	F:	Surface Skimming	I:	Pressure Filtration
C:	Equalization	G:	Clarification	J:	Vapor Compression Distillation
D:	Neutralization with Lime			K:	Recycle

NOTE: Refer to Table VIII-12 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative

TABLE VIII-33

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Other Metals, Without Fume Scrubbers
: Wire Products/Fasteners

Model Size - TPD: 15
Oper. Days/Year : 260
Turns/Day : 2

C&TT Step	Total NSPS/PSNS Alt. 1	NSPS/PSNS Alternative 2								NSPS/PSNS Alternative 3 Alt. 2 Plus:		NSPS/PSNS Alternative 4 Alt. 2 Plus:		
		A	B	C	D	E	F	G	Total	H	Total	I	J	Total
Investment ($ x 10^{-3})	225.3	5.4	13.9	29.2	12.6	2.7	37.9	59.0	160.7	15.4	176.1	1,024.3	15.1	1,200.1
Annual Costs ($ x 10^{-3})														
Capital	20.3	0.3	1.2	2.6	1.1	0.2	3.4	5.3	14.3	1.4	15.7	92.1	1.4	107.8
Operation & Maintenance	7.9	0.2	0.5	1.0	0.4	0.1	1.3	2.1	5.6	0.5	6.1	35.9	0.5	42.0
Land	0.5	0.1	0.1	0.1	0.1		0.1	0.1	0.6	0.1	0.7	0.1	0.1	0.8
Sludge Disposal	0.4							0.4	0.4		0.4			0.4
Hazardous Waste Disposal														
Oil Disposal														
Energy & Power	7.5		0.2	0.3	0.1	0.1	0.1	0.3	1.1	0.1	1.2	5.8		6.9
Steam														
Waste Acid														
Crystal Disposal														
Chemical	0.8				0.5				0.5		0.5			0.5
TOTAL	31.4	0.8	2.0	4.3	2.2	0.4	4.9	8.2	22.8	2.1	24.9	133.9	2.0	158.7
Credits														
Scale														
Sinter														
Oil														
Acid Recovery														
TOTAL CREDITS														
NET TOTAL	31.4	0.8	2.0	4.3	2.2	0.4	4.9	8.2	22.8	2.1	24.9	133.9	2.0	158.7

KEY TO C&TT STEPS

A: Rinse Reduction
B: Equalization
C: Neutralization with Lime
D: Flocculation with Polymer
E: Surface Skimming
F: Clarification
G: Vacuum Filtration
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

Refer to Table VIII-13 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-34

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating
Subdivision: Other Metals, With Fume Scrubbers
: Wire Products/Fasteners

Model Size - TPD: 15
Oper. Days/Year : 260
Turns/Day : 2

C&TT Step	Total NSPS/PSNS	NSPS/PSNS Alternative 2									NSPS/PSNS Alternative 3 Alt. 2 Plus:		NSPS/PSNS Alternative 4 Alt. 2 Plus:		
	Alt. 1	A	B	C	D	E	F	G	H	Total	I	Total	J	K	Total
Investment ($ x 10^{-3})	404.2	53.8	5.4	37.2	62.5	20.0	5.3	68.7	82.3	335.2	32.6	367.8	1,454.8	24.0	1,814.0
Annual Costs ($ x 10^{-3})															
Capital	36.3	4.8	0.5	3.3	5.6	1.8	0.5	6.2	7.4	30.1	2.9	33.0	130.8	2.2	163.1
Operation & Maintenance	14.2	1.9	0.2	1.3	2.2	0.7	0.2	2.4	2.9	11.8	1.1	12.9	50.9	0.8	63.5
Land	0.5		0.1	0.1	0.1	0.1		0.1	0.1	0.6	0.1	0.7	0.1	0.1	0.8
Sludge Disposal	0.5								0.5	0.5		0.5			0.5
Hazardous Waste Disposal															
Oil Disposal															
Energy & Power	3.4	0.6		0.3	0.6	0.1	0.1	0.2	0.7	2.6	0.1	2.7	11.6		14.2
Steam															
Waste Acid Crystal Disposal															
Chemical	3.0				1.6	1.4				3.0		3.0			3.0
TOTAL	57.9	7.3	0.8	5.0	10.1	4.1	0.8	8.9	11.6	48.6	4.2	52.8	193.4	3.1	245.1
Credits															
Scale															
Sinter															
Oil															
Acid Recovery															
TOTAL CREDITS															
NET TOTAL	57.9	7.3	0.8	5.0	10.1	4.1	0.8	8.9	11.6	48.6	4.2	52.8	193.4	3.1	245.1

KEY TO C&TT STEPS

A: Fume Scrubber Recycle
B: Rinse Reduction
C: Equalization
D: Neutralization with Lime
E: Flocculation with Polymer
F: Surface Skimming
G: Clarification
H: Vacuum Filtration
I: Pressure Filtration
J: Vapor Compression Distillation
K: Recycle

NOTE: Refer to Table VIII-14 for a detailed cost analysis of the NSPS-1/PSNS-1 treatment alternative.

TABLE VIII-35

BPT COST REQUIREMENTS
HOT COATING SUBCATEGORY

(All costs in millions of 7/1/78 dollars)

	Capital Investment Costs			Annual Costs		
	In Place	Required	Total Capital	Current[1]	Additional[2]	Total Annual[3]
Galvanizing						
Strip, Sheet, Miscellaneous	19.67	1.91	21.58	3.02	0.34	3.36
Wire Products and Fasteners	6.54	1.32	7.86	0.86	0.21	1.07
Subtotal - Galvanizing	26.21	3.23	29.44	3.88	0.55	4.43
Terne Coating						
Strip, Sheet Only	1.84	0.37	2.21	0.27	0.06	0.33
Other Metals						
Strip, Sheet, Miscellaneous	0.72	1.00	1.72	0.11	0.16	0.27
Wire Products and Fasteners	1.05	0.00	1.05	0.04	0.00	0.04
Subtotal - Other Metals	1.77	1.00	2.77	0.15	0.16	0.31
Hot Coating Totals	29.82	4.60	34.42	4.30	0.77	5.07

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(1) Annual costs for BPT treatment components already in place.
(2) Annual costs for BPT treatment components yet to be installed to attain limits.
(3) Total projected annual costs to attain BPT limits.

TABLE VIII-36

BAT COST REQUIREMENTS
HOT COATING SUBCATEGORY

(All costs in millions of 7/1/78 dollars)

	Capital Investment Costs			Annual Costs		
	In-Place	Required	Total Capital	Current[1]	Additional[2]	Total Annual[3]
Galvanizing:						
Strip, Sheet & Miscellaneous	0.314	0.320	0.634	0.044	0.045	0.089
Wire Products & Fasteners	0.044	0.034	0.078	0.006	0.005	0.011
Subtotal - Galvanizing	0.358	0.354	0.712	0.050	0.050	0.100
Terne Coatings:						
All Products	0.000	0.0158	0.158	0.000	0.022	0.022
Other Metal Coatings:						
Strip, Sheet & Miscellaneous	NA	NA	NA	NA	NA	NA
Wire Products & Fasteners	0.104	0.000	0.104	0.000[4]	0.000	0.000
Subtotal - Other Metals	0.104	0.000	0.104	0.000	0.000	0.000
Hot Coating Totals	0.462	0.512	0.974	0.050	0.072	0.122

NA - Not Applicable, since this segment has no fume scrubbers.

(1) Annual costs for BAT components already in place.
(2) Annual costs for BAT components yet to be installed to attain limits.
(3) Total projected annual costs attributable to BAT requirements.
(4) The only plant in this segment which has fume scrubbers has shut down permanently.

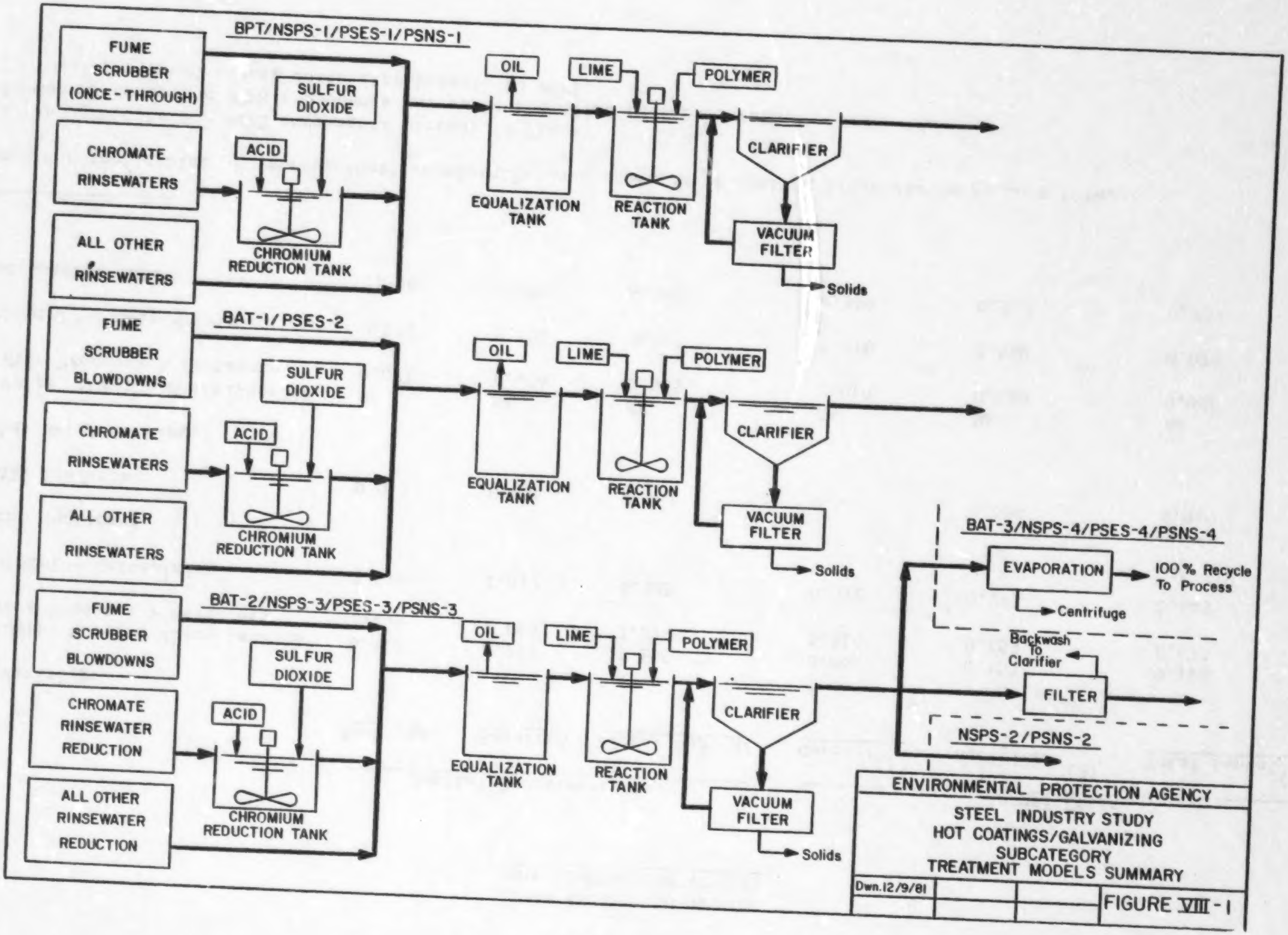
TABLE VIII-37

PSES COST REQUIREMENTS
HOT COATING SUBCATEGORY

	Capital Investment Costs			Annual Costs		
	In-Place	Required	Total Capital	Current(1)	Additional(2)	Total Annual(3)
Galvanizing:						
Strip, Sheet & Miscellaneous	0.412	0.747	1.159	0.064	0.102	0.166
Wire Products & Fasteners	2.164	1.065	3.229	0.314	0.163	0.477
Subtotal - Galvanizing	2.576	1.812	4.388	0.378	0.265	0.643
Terne Coatings:						
All Products	0.013	0.054	0.067	0.002	0.008	0.010
Other Metal Coatings:						
Strip, Sheet & Miscellaneous	NA	NA	NA	NA	NA	NA
Wire Products & Fasteners	0.071	0.434	0.505	0.010	0.060	0.070
Subtotal - Other Metals	0.071	0.434	0.505	0.010	0.060	0.070
Hot Coating Totals	2.660	2.300	4.960	0.390	0.333	0.723

NA - Not Applicable. No strip, sheet or miscellaneous other metal coating lines discharge to a POTW.

(1) Annual costs for PSES components already in place.
(2) Annual costs for PSES components yet to be installed to attain PSES.
(3) Total projected annual costs attributable to PSES.

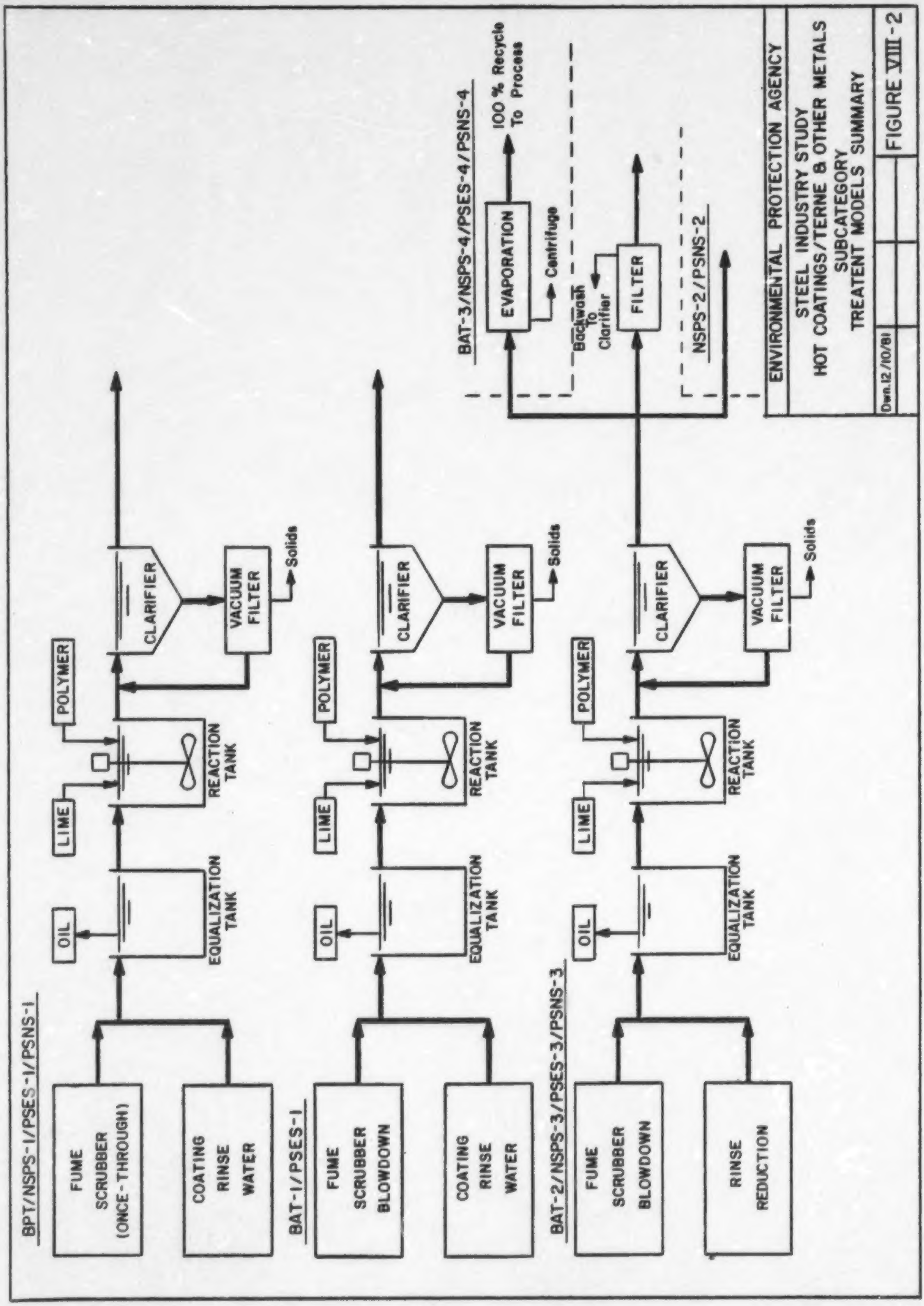

BPT/NSPS-1/PSES-1/PSNS-1
FUME SCRUBBER (ONCE-THROUGH)
CHROMATE RINSEWATERS
ALL OTHER RINSEWATERS
SULFUR DIOXIDE
ACID
CHROMIUM REDUCTION TANK
OIL
LIME
POLYMER
EQUALIZATION TANK
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids
BAT-1/PSES-2
FUME SCRUBBER BLOWDOWNS
CHROMATE RINSEWATERS
ALL OTHER RINSEWATERS
SULFUR DIOXIDE
ACID
CHROMIUM REDUCTION TANK
OIL
LIME
POLYMER
EQUALIZATION TANK
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids
BAT-2/NSPS-3/PSES-3/PSNS-3
FUME SCRUBBER BLOWDOWNS
CHROMATE RINSEWATER REDUCTION
ALL OTHER RINSEWATER REDUCTION
SULFUR DIOXIDE
ACID
CHROMIUM REDUCTION TANK
OIL
LIME
POLYMER
EQUALIZATION TANK
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids
BAT-3/NSPS-4/PSES-4/PSNS-4
EVAPORATION
100% Recycle To Process
Centrifuge
Backwash To Clarifier
FILTER
NSPS-2/PSNS-2

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/GALVANIZING
SUBCATEGORY
TREATMENT MODELS SUMMARY

Dwn. 12/9/81

FIGURE VIII-1


BPT/NSPS-1/PSES-1/PSNS-1
FUME SCRUBBER (ONCE-THROUGH)
COATING RINSE WATER
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids
BAT-1/PSES-1
FUME SCRUBBER BLOWDOWN
COATING RINSE WATER
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids
BAT-2/NSPS-3/PSES-3/PSNS-3
FUME SCRUBBER BLOWDOWN
RINSE REDUCTION
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids
BAT-3/NSPS-4/PSES-4/PSNS-4
EVAPORATION
Centrifuge
100 % Recycle To Process
Backwash To Clarifier
FILTER
NSPS-2/PSNS-2
Dwn.12/10/81

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/TERNE & OTHER METALS
SUBCATEGORY
TREATENT MODELS SUMMARY

FIGURE VIII-2

HOT COATING SUBCATEGORY

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

Introduction

The Agency has promulgated BPT limitations which are based on the same model treatment technologies used as the basis for the BPT limitations originally promulgated in 1976 and those proposed in January 1981 (46 FR 1858). Reanalysis of the flow data for this subcategory indicate that the model rinsewater flows for strip, sheet and miscellaneous products used as the basis for the original regulation is appropriate. The rinsewater flows for wire products and fasteners have been increased to reflect the larger data base currently available. The Agency determined, however, that discharges from fume scrubbers should be separately limited. Accordingly, the Agency has established a fume scrubber subdivision. The promulgated BPT limitations have been established on the basis of lime precipitation and sedimentation. A review of the treatment processes and effluent limitations associated with the hot coating subcategory follows.

Identification of BPT

Based upon the information contained in Sections III through VIII, the Agency determined that effective pollutant load reductions for hot coating operations for the BPT level of treatment can be accomplished through the use of the following treatment systems:

A. Galvanizing Operations

This treatment system sequence includes: equalization of various wastewater sources; blending; separate chromium reduction for wastewaters from the chromate rinse steps; lime neutralization with mixing in a reactor tank; polymer addition to enhance flocculation and sedimentation; automatic oil skimming; and clarification with sufficient retention time to settle suspended solids. All wastewaters, including fume scrubber wastewaters, are treated once-through by this system. This system is illustrated in FIgure IX-1.

B. Terne and Other Metal Coating Operations

All steps in the BPT model treatment system are the same as for galvanizing, except that a separate chromium reduction step is not included. All process and fume scrubber wastewaters are treated once-through by this system. This system is illustrated in Figure IX-2.

Rationale for Selection of BPT

The following discussion summarizes the factors evaluated by the Agency in selecting the model BPT treatment systems and the respective BPT limitations.

BPT Model Flows

In determining the BPT model flows all of the flow data reported by the industry were used, except where the Agency determined that they are not representative of hot coating discharges. In some cases, the flows reported by industry included both process and noncontact cooling water, thus overstating process flow rates. In other cases, maximum design flows were given, which were paired with "typical" production data, yielding artificially high gallon/ton figures. The flow rate established as the BPT model flow is the average of the reported flows for those plants which are representative of hot coating operations. A description of these data is presented in Table V-1. A summary of flows shows the following comparisons:

	Average Applied Flow Rates GPT	GPM	No. of Lines Included in Average
Strip,Sheet,Misc. Products:			
Rinsewaters -Galvanizing	595		48 of 51
-Terne	522		5 of 6
-Other	345		3 of 4
Wire Products & Fasteners:			
Rinsewaters - Galvanizing	2356		56 of 58
- Other	2184		14 of 15
Fume Scrubbers:			
Galvanizing SSM		98	10 of 21
Galvanizing WPF		38	12 of 12
Terne		92	3 of 3
Other-SSM[1]		-	-
Other-WPF[2]		120	3 of 3

[1] All scrubbers are listed as "dry".
[2] Only one plant with three scrubbers reported data, and it has since shut down.

The Agency considers those plants that were not used to develop the model flow rates are not representative of well operated plants. These plants reported flow rates that ranged from three to eight times greater than the average flow for the respective subdivision. As demonstrated at other hot coating operations, product quality is not adversely affected where low discharge flows are achieved. Thus the Agency believes that the high discharge flow rates reported by some plants are unnecessary for proper operation of the plant.

Since flow rates, by product, are similar regardless of applied coating, a common BPT model flow was used for each subdivision. The model flows used are 600 GPT for strip, sheet, and miscellaneous product rinsewaters, and 2400 GPT for wire product or fasteners. The fume scrubber limitations were based on a model flow of 100 gallons per minute per scrubber.

Effluent Quality

The effluent concentrations used by the Agency to establish the effluent limitations for this subcategory are based on the evaluation of long term data reported by the industry and sampling data acquired by the Agency. These effluent data are from treatment facilities in which hot coating wastewaters are co-treated with pickling wastewaters. These data are representative of the effectiveness of the model treatment upon hot coating wastewaters. This co-treatment practice is commonly used in the industry to treat these wastewaters. These treatment practices are the same as the BPT model treatment system. The evaluation to these data are presented in Appendix A to Volume I. The results for the pollutants limited in this subcategory are as follows:

	Concentration (mg/l) 30-day Average	Daily Maximum
TSS	30	70
O & G	10	30
Lead	0.15	0.45
Zinc	0.10	0.30
Chromium, hexavalent*	0.02	0.06

*Hexavalent chromium is limited only at galvanizing lines with discharge from the chromate rinse step of the coating operation.

Demonstration of BPT Limitations

The rationale for selecting these five pollutants for limitation is presented in detail in Section VI. These pollutants are characteristic of hot coating wastewaters. As discussed in Section VI, the Agency believes that regulation of these five pollutants will result in effective control of other toxic pollutants present in these wastewaters. In addition, limiting a common set of pollutants for all hot coating discharges facilitates co-treatment of the various hot coating wastewaters, as well as with compatible wastewaters from other subcategories.

The BPT limitations were developed using the model flows and effluent concentrations discussed above. These are presented in Table IX-1. The achievability of these effluent limitations at plants sampled by the Agency are discussed below. The limitations and the effluent loads for the sampled plants are compared in Table IX-2 for strip, sheet and miscellaneous product coating operations and Table IX-3 for wire products and fasteners.

Total Suspended Solids (TSS)

Of the twelve plants surveyed (two visited twice), only one Plant V-2, was not achieving adequate suspended solids removal. This poor performance is attributable to insufficient retention time in a settling basin. This plant discharges its wastewaters to a POTW. One other plant (Plant MM-2) was not achieving the 30-day average TSS limitations, but was discharging TSS loads at less than its respective daily maximum limitation during the 2-3 day sampling survey. The other plants were well in compliance with the 30-day BPT limitations.

Oil and Grease

All of the sampled plants provided some degree of oil removal. Some plants accomplished this by skimming, others by flocculation and settling.

The two plants that were sampled on two separate occasions were found to have discharges exceeding the BPT limitations during the first survey (listed as Plants NN-2 and PP-2). However, these plants (listed as 118 and 113, respectively) had improved their oil removal so that during the toxic pollutant survey their discharges were in compliance with the limitations. The only other discharger failing to achieve the BPT limitations for oil and grease was Plant MM-2. An excessive contribution of 22.5 mg/l oil and grease was found in plant effluents. The discharge from this plant contained cold rolling mill wastes which were not adequately treated in this system. This treatment system experienced wide fluctuations in pH indicating some control problems were being experienced at this plant. All other data support BPT limits on oil and grease.

Zinc

Analysis for zinc was performed for ten of the plants (including the two revisited plants). The data demonstrate compliance with the BPT limitations at all but one plant (Plant NN-2/118).

Lead

The BPT 30-day average limitations for lead from hot coating lines were being met by seven of the plants surveyed. Three other operations, although exceeding the 30-day average limitations were meeting the daily maximum limits, averaging 54% over their respective 30-day average limitations.

Hexavalent Chromium

Hexavalent chromium was also effectively removed to low concentration levels, clearly demonstrating the achievability of the limitations. Data from the 12 sampling visits performed by the Agency demonstrate that compliance with the BPT limitations was being achieved during 11 of these visits. One plant exceeded the limitation for fume scrubbers by 13% - 26% for two of its three scrubbers. However, the total allowance for fume scrubbers is exceeded by less than 4%. Additionally, long term effluent data from Plant 0868A for the strip galvanizing operation further demonstrates the achievability of the limitations. Data for a two year period demonstrated an average effluent concentration of 0.001 mg/l and a maximum concentration of 0.005 mg/l. These concentrations are well below the concentration basis used for the effluent limitations.

pH

Of the plants visited, three were found to be operating outside the pH limitations for at least part of the time, while the other six were achieving pH limits of 6.0 to 9.0 during the sampling surveys. Plant V-2 is equipped with pH controls, but insufficient neutralizing agents were being added to elevate pH levels to near neutral prior to discharge to a large POTW. Plant MM-2 jointly treated a variety of wastewaters in a large central treatment facility which also has pH control, but has apparently experienced some difficulty in controlling wide fluctuations in pH. Plant 112 was usually within pH constraints, but had a high reading of pH 9.5 for approximately six hours during the sample runs. The BPT pH limitations are demonstrated to be readily achievable through the application of proper control technology and monitoring equipment.

TABLE IX-1

BPT AND BCT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING SUBCATEGORY

		Model Flow (GPT)	Unit	TSS	O&G	Hex. Chromium$^{(1)}$*	Lead*	Zinc*	pH Units
Concentration Basis:	30-Day Avg	-		30 mg/l	10 mg/l	0.02 mg/l	0.15 mg/l	0.1 mg/l/	-
	Daily Max	-		70 mg/l	30 mg/l	0.06 mg/l	0.45 mg/l	0.3 mg/l	-
SSM - Basic Allowance	30-Day Avg	600	Kg/Kkg	0.0751	0.0250	0.0000501	0.000375	0.000250	6.0-9.0
	Daily Max	600	Kg/Kkg	0.175	0.0751	0.000150	0.00113	0.000751	
Add for Scrubber$^{(2)}$	30-Day Avg	100 GPM	Kg/Day	16.3	5.45	0.0109	0.0819	0.0545	6.0-9.0
	Daily Max	100 GPM	Kg/Day	38.1	16.3	0.0327	0.245	0.163	
WPF - Basic Allowance	30-Day Avg	2400	Kg/Kkg	0.300	0.100	0.000200	0.00150	0.00100	6.0-9.0
	Daily Max	2400	Kg/Kkg	0.701	0.300	0.000601	0.00451	0.00300	
Add for Scrubber$^{(2)}$	30-Day Avg	100 GPM	Kg/Day	16.3	5.45	0.0109	0.0819	0.0545	6.0-9.0
	Daily Max	100 GPM	Kg/Day	38.1	16.3	0.0327	0.245	0.163	

---

(1) Applies only to galvanizing operations which discharge wastewaters from a chromate rinsing step.
(2) Additional allowance for operations using wet scrubbers to control fumes originating from coating operations. Allowance in Kg/Day applies to each scrubber serving coating operations.

* : BPT Limitations only.
SSM: Strip, sheet and miscellaneous products
WPF: Wire, wire product and fasteners

TABLE IX-2

JUSTIFICATION OF BPT LIMITATIONS
HOT COATING SUBCATEGORY
STRIP, SHEET & MISCELLANEOUS PRODUCTS

Subdivision	Coating Metal	Effluent Loads in kg/kkg (lbs/1000 lbs)[1]					pH (Units)	Flow (gal/ton)	C&TT Components
		TSS	O&G	Hex. Chromium	Lead	Zinc			
Galvanizing, Terne & Other Coatings - Rinse waters:									
Promulgated BPT	All	0.0751	0.0250	0.0000501	0.000375	0.000250	6-9	600	CR;E;NL;FLP;SS;CL;VF
Plant Visit Data:									
112 (0396D)	Galv.	0.0515	0.00719	NR	(0.000682)	0.000237	(8.6-9.5)	287	E;NL;AE;FLP;CL;VF
113 (0856D)	Terne	0.0402	0.0146	0.000007	0.000183	0.000227	(5.2-6.5)	877[2]	E;NL;FLP;CL;SS;VF
114 (0948C)	Galv.	0.00528	0.00528	<0.000001	<0.000044	0.000062	7.6-7.8	211	E;FLP;NL;CL;SS
119 (0476A)	Galv.	0.00245	0.00675	0.000003	<0.000061	0.000037	6.6-9.0	147	E;NL;AE;SS;FLP;CL;VF
MM-2 (0856F)	Galv.	(0.140)	(0.0528)	0.000009	0.000117	0.000082	6.4-7.6	562[2]	CR;NW;NL;FLP;CL;SS
NN-2 (0920E)	Galv.	0.0136	(0.0329)	0.000041	0.000061	(0.00462)	7.9	814[2]	E;NL;FLP;CL;SS;VF
(0868A)[3]	Galv.	0.0205	0.00342	<0.000001	NR	NR	6.3-8.9	164[2]	CR;NL;FLP;SS;FDSP
Fume Scrubbers:									
Promulgated BPT (kg/day)	All	16.3	5.45	0.0109	0.0817	0.0545	6-9	100 GPM/Scrubber	As Above
Plant Visit Data									
113 (0856D)	Terne	3.00	1.09	0.00055	0.0136	0.0169	(5.2-6.5)	50 GPM	As Above
MM-2 (0856F)	Galv.	(34.3)	(12.86)	0.00229	0.0286	0.0200	6.4-7.6	105 GPM	As Above
NN-2 (0920E) #1	Galv.	4.58	(11.10)	(0.0137)	0.0206	(1.56)	7.9	210 GPM	As Above
NN-2 (0920E) #2	Galv.	4.14	(10.05)	(0.0124)	0.0186	(1.41)	7.9	190 GPM	As Above
NN-2 (0920E) #3	Galv.	2.62	(6.34)	0.00785	0.0118	(0.889)	7.9	120 GPM	As Above
(0868A)[3]	Galv.	1.63	0.27	0.00005	NR	NR	6.3-8.9	10 GPM	As Above

---

(1) All fume scrubber loads are expressed as kg/day.
(2) Flow attributable to rinsing operations. Additional flows from fume scrubbers appear below.
(3) Long-term data reported by Plant 0868A covers a two-year period of operations

NR : Not reported for this plant.
( ): Load discharged exceeds BPT limitation.

TABLE IX-3

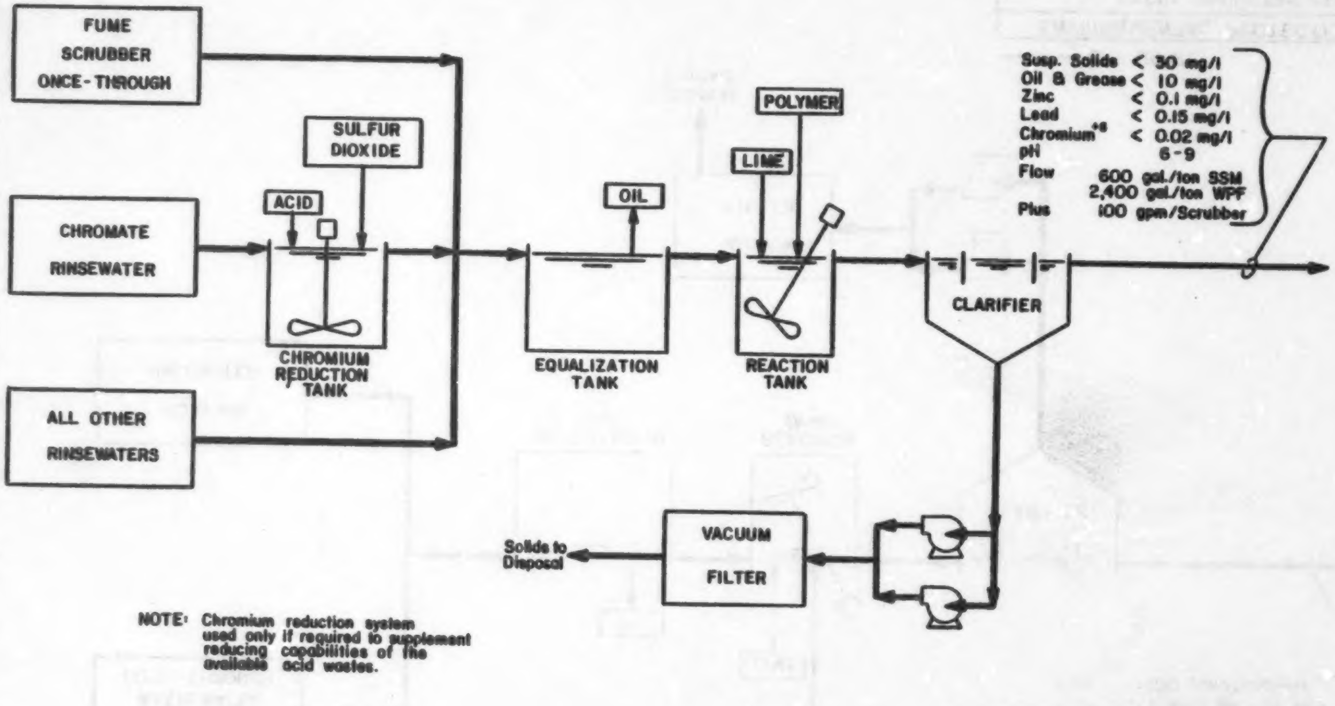
JUSTIFICATION OF BPT LIMITATIONS
HOT COATING SUBCATEGORY
WIRE PRODUCTS & FASTENERS

Subdivision	Coating Metal	Effluent Loads in kg/kkg (lbs/1000 lbs) TSS	O&G	Hex. Chromium	Lead	Zinc	pH (Units)	Flow (gal/ton)	C&TT Components
Galvanizing and Other Metal Coatings:									
Promulgated BPT	All	0.300	0.100	0.000200	0.00150	0.00100	6-9	2400	E;NL;FLP;SS;CL;VF
Plant Visit Data:									
111 (0612)	Galv.	0.0649	0.0236	0.000012	0.00112	0.000708	8.3-8.5	1414	NL;AE;CL;FDSP
116 (0112I)(1)	Galv.	0.0247	0.0099	0.000007	0.00020	0.00032	7.3-7.7	592	NL;E;AE;FLP;SS;CL;FDSP
I-2 (0856P)	Galv.	0.0358	0.0128	NR	NR	NR	6.7	220	E;SL;SS
116 (0112I)(1)	Aluminum	0.165	0.0661	0.000050	0.00132	(0.0297)	7.3-7.7	3960	NL;E;AE;FLP;SS;CL;FDSP

---

(1) Data for this plant represents treated wastewater collected prior to filtration. This sample is more representative of BPT technology. For actual effluent loads, refer to Tables VII-2 and VII-4.

NR : Not reported for this plant.
( ): Load discharged exceeds BPT limitation.


FUME SCRUBBER ONCE-THROUGH
CHROMATE RINSEWATER
ALL OTHER RINSEWATERS
SULFUR DIOXIDE
ACID
CHROMIUM REDUCTION TANK
OIL
EQUALIZATION TANK
POLYMER
LIME
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids to Disposal
Susp. Solids < 30 mg/l
Oil & Grease < 10 mg/l
Zinc < 0.1 mg/l
Lead < 0.15 mg/l
Chromium+6 < 0.02 mg/l
pH 6 - 9
Flow 600 gal./ton SSM
2,400 gal./ton WPF
Plus 100 gpm/Scrubber
BPT MODEL

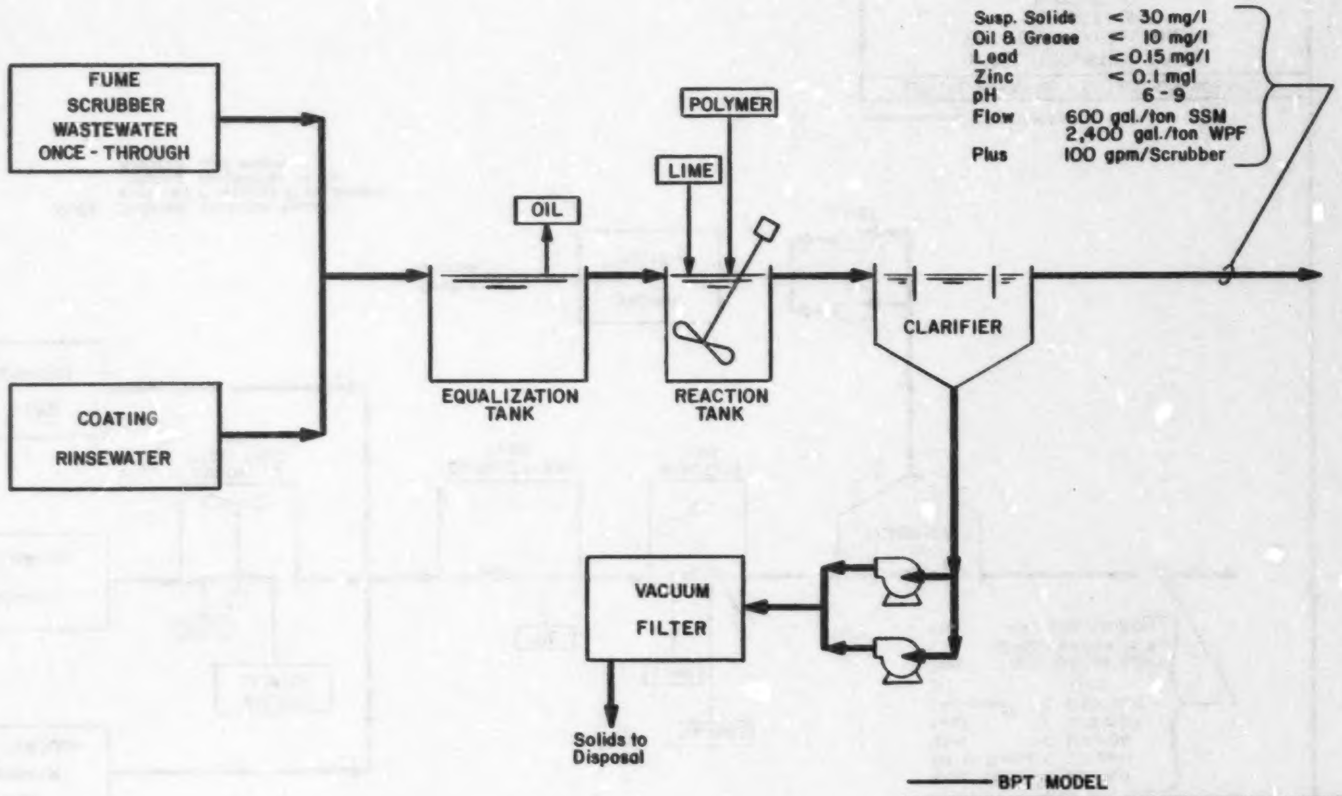
NOTE: Chromium reduction system used only if required to supplement reducing capabilities of the available acid wastes.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING/GALVANIZING
SUBCATEGORY
BPT MODEL

Dwn.12/10/81

FIGURE IX-1


FUME SCRUBBER WASTEWATER ONCE - THROUGH
COATING RINSEWATER
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids to Disposal
Susp. Solids < 30 mg/l
Oil & Grease < 10 mg/l
Lead < 0.15 mg/l
Zinc < 0.1 mgl
pH 6 - 9
Flow 600 gal./ton SSM
2,400 gal./ton WPF
Plus 100 gpm/Scrubber
BPT MODEL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS-TERNE & OTHER METALS
SUBCATEGORY
BPT MODEL

Dwn. 12/11/81

FIGURE IX-2

HOT COATING SUBCATEGORY

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

Introduction

The Best Available Technology Economically Available (BAT) effluent limitations are to be attained by July 1, 1984. BAT is determined by reviewing subcategory practices and identifying the best economically achievable control and treatment technologies employed within the subcategory. In addition, a technology that is readily transferable from another subcategory or industry may be identified as BAT.

This section identifies the BAT alternative treatment systems considered for the hot coating subcategory. The rationale for selecting the BAT alternative treatment system is presented along with the BAT limitations.

The BAT alternative treatment systems for hot coating operations are summarized in Table VIII-4, steps H through L for galvanizing, and steps G through K for all other types of coatings. These alternative treatment systems are illustrated in Figure VIII-1. Tables VIII-15 through VIII-24 provide the model costs for each of the alternative treatment systems. Table X-1 presents the alternative limitations for each hot coating subdivision. Figures X-1 and X-2 illustrate the BAT model treatment systems.

Identification of BAT

Each of the BAT alternative treatment systems described below was developed to be applied to in place model BPT treatment systems.

BAT Alternative 1

The first BAT alternative relies on flow reduction by recycling fume scrubber wastewaters and limiting blowdowns from the scrubber system to 15 gpm. This reduced scrubber discharge is combined with the rinsewater (at the respective BPT model flow rate) and treated in the BPT model treatment system).

BAT Alternative 2

This alternative includes further reductions in wastewater flows through minimization of rinsewater discharges. This reduced rinsewater flow is combined with the blowdown from the fume scrubber recycle system and treated in the BPT model treatment system. The effluent is then further treated by pressure filtration.

BAT Alternative 3

The third alternative includes vapor compression distillation to achieve zero discharge. This technology is applied in lieu of the filters in BAT alternative 2. The wastewater is evaporated, with a clean condensate returned to the process. Residual solid material is dried and landfilled.

Flow Rates

Wastewater discharge flow rates are reduced prior to treatment as a first step toward control of toxic pollutants. Where fume scrubbers are installed, these wastewaters are recirculated at the scrubbers with the blowdown being directed to the treatment system. These wastewaters can be recycled at rates in excess of 85%, as shown by data for several galvanizing operations. The Agency believes this recycle rate can be achieved by all operations in this subcategory. While fume scrubber wastewaters were discharged on a once thru basis for the three terne operations studied, two of these plants had discharges less than 15 GPM. Scrubbers are not commonly installed at lines coating with other metals. The applied flows and discharge rates, and percent recycle are presented in Table X-2. The data clearly demonstrate the achievability of the model blowdown flow rate (15 gpm) used for fume scrubbers for each of the BAT alternative treatment systems.

Several hot coating lines are operated with dragout recovery, and reuse or recirculation of the rinsewater to further reduce the discharge of wastewaters. BAT Alternatives 2 and 3 include reduction in discharges of rinsewaters and fume scrubber wastewaters.

The information submitted by the industry shows that rinsewater discharges are commonly reduced by reuse or recirculation at hot coating operatons. Zero discharge has been reported at several plants. These methods of flow reduction evidently have no adverse effect on product quality, despite the low discharge flow rates achieved. The Agency has used cascade rinsing to model rinsewater flow reduction. This method of flow reduction is used at pickling and electroplating operations, both of which are similar processes. Water is used in the same manner to rinse the products after it has been processed. Cascade rinsing is equally, if not more, effective in cleaning the product as conventional rinsing systems, and, therefore, will have no adverse effect on product quality. Additionally, the use of cascade rinsing results in more conservative cost estimates for achieving the lower discharge flow rates included in BAT Alternatives 2 and 3. Cascade rinsing can be applied to hot coating operations to reduce rinsewater flows. However, as shown by the data in Table X-3 and demonstrated at hot coating and pickling operations, the reduced rinsewater flows can be achieved by methods other than cascade rinsing. The rinsewater flows are reduced to 150 gal/ton for operations coating strip, sheet and miscellaneous products. For those operations coating wire products and fasteners, the rinse water flows are reduced to 600 gallons/ton. The rinsewater flow data presented in Table X-3 demonstrate the achievability of the discharge flow rates used as basis for BAT Alternatives 2 and 3.

Effluent Limitations

The Agency has selected the same toxic metal pollutants, for which BPT limitations have been established, for limitation at the BAT level. These pollutants are lead and zinc for all coating operations, and hexavalent chromium for those galvanizing operations using chromate rinses. The rationale for the selection of these toxic metal pollutants are presented in Sections VI and IX. The effluent concentrations, model flow rates and the effluent limitations for each of the BAT alternative treatment systems are presented in Table X-1.

Selection of BAT Alternative

The Agency selected BAT Alternative 1 as the BAT model treatment system upon which to base the BAT limitations. Hence, the BAT limitations for the toxic metal pollutants for the fume scrubbing subdivision are more stringent than the respective BPT limitations, reflecting the flow reduction attained through recycle. The BAT limitations for the other subdivisions, which include only rinsewater discharges, are the same as the BPT limitations for metal pollutants. No additional treatment for the rinsewater discharge is required beyond BPT.

BAT Alternative 2 was not selected, since the Agency has concluded that it may not be feasible to retrofit cascade rinse systems at all existing hot coating operations at a reasonable cost. Space limitations and the configuration of some hot coating lines would require in some instances reconstruction of the entire line in order to retrofit cascade rinsing systems. In addition, as indicated by the toxic metal concentrations present in Table X-1, filtration does not result in substantial reduction in the discharge of toxic metals over that achieved at the BPT level of treatment. The retrofit problems associated with cascade rinsing are not experienced in any of the other treatment systems considered by the Agency. Cascade rinsing is unique, in that, it is the only technology which requires modification to the production process. All other model treatment systems used by the Agency are end-of-pipe systems.

BAT Alternative 3 was rejected due to its high energy consumption and associated costs.

Demonstration of the BAT Limitations

As noted above, the model BAT treatment system flow rates for fume scrubbers are achieved at Plants 0060G, 0112F, 0460C, 0492A, 0856P, 0864B, 0868A and 0920D. The rinsewater flows are the same as the rinsewater flows used at BPT, and its achievability is discussed in

Section IX. The effluent quality data used to develop the BPT and BAT limitations are demonstrated on a long term basis at plants 0584E, 0856D and 0860B. Other short term sampling data as discussed in Section IX also demonstrate the achievability of these concentrations.

TABLE X-1

BAT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING SUBCATEGORY

		Model Flow (GPT)	Unit	Hex. Chromium(1)	Lead	Zinc
Alternative 1:*						
Concentration Basis	30-Day Avg	-		0.02 mg/l	0.15 mg/l	0.1 mg/l
	Daily Max	-		0.06	0.45	0.3
1. SSM - Basic Allowance	30-Day Avg	600	Kg/Kkg	0.0000501	0.000375	0.000250
	Daily Max	600	Kg/Kkg	0.000150	0.00113	0.000751
Add for Scrubber(2)	30-Day Avg	15 GPM	Kg/Day	0.00163	0.0123	0.00819
	Daily Max	15 GPM	Kg/Day	0.00490	0.0368	0.0245
2. WPF - Basic Allowance	30-Day Avg	2400	Kg/Kkg	0.000200	0.00150	0.00100
	Daily Max	2400	Kg/Kkg	0.000601	0.00451	0.00300
Add for Scrubber(2)	30-Day Avg	15 GPM	Kg/Day	0.00163	0.0123	0.00819
	Daily Max	15 GPM	Kg/Day	0.00490	0.0368	0.0245
Alternative 2:						
Concentration Basis	30-Day Avg	-		0.02 mg/l	0.1 mg/l	0.1 mg/l
	Daily Max	-		0.06	0.3	0.3
1. SSM - Basic Allowance	30-Day Avg	150	Kg/Kkg	0.0000125	0.0000626	0.0000626
	Daily Max	150	Kg/Kkg	0.0000375	0.000188	0.000188
Add for Scrubber(2)	30-Day Avg	15 GPM	Kg/Day	0.00163	0.00819	0.00819
	Daily Max	15 GPM	Kg/Day	0.00490	0.0245	0.0245
2. WPF - Basic Allowance	30-Day Avg	600	Kg/Kkg	0.0000501	0.000250	0.000250
	Daily Max	600	Kg/Kkg	0.000150	0.000751	0.000751
Add for Scrubber(2)	30-Day Avg	15 GPM	Kg/Day	0.00163	0.00819	0.00819
	Daily Max	15 GPM	Kg/Day	0.00490	0.0245	0.0245
Alternative 3:						
Concentration Basis	30-Day Avg	-		-	-	-
	Daily Max	-		-	-	-
1. SSM - Basic Allowance	All	0	Kg/Kkg	No Discharge of Process Wastewater Pollutants to Navigable Streams		
Add for Scrubber(2)	All	0	Kg/Day	No Discharge of Process Wastewater Pollutants to Navigable Streams		
2. WPF - Basic Allowance	All	0	Kg/Kkg	No Discharge of Process Wastewater Pollutants to Navigable Streams		
Add for Scrubber(2)	All	0	Kg/Day	No Discharge of Process Wastewater Pollutants to Navigable Streams		

---

(1) Applies only to galvanizing operations which discharge wastewaters from a chromate rinsing step.
(2) Additional allowance for operations using wet scrubbers to control fumes originating from coating operations. Allowance in Kg/Day applies to each scrubber serving coating operations.

* : Selected BAT alternative.
SSM: Strip, sheet and miscellaneous products
WPF: Wire, wire products and fasteners

TABLE X-2

JUSTIFICATION OF BAT FLOW BASIS
HOT COATING SUBCATEGORY
FUME HOOD SCRUBBER RECYCLE SYSTEMS

Plant	Product	Applied GPM	Discharged GPM	Percent Recycle	Plant Data Demonstrates: Effluent GPM	Plant Data Demonstrates: Percent Reduction
BAT Basis	All	100	15	85.0	-	-
0060G-1	WPF	66	6	90.9	X	X
0060G-2	WPF	66	6	90.9	X	X
0060G-3	WPF	66	6	90.9	X	X
0060G-4	WPF	165	15	90.9	X	X
0060G-5	WPF	79	7	91.1	X	X
0060S-1	WPF	200	20	90.0		X
0060S-2	WPF					X
0060S-3	WPF	79	7	91.1	X	X
0112F-1	WPF	60	8	86.7	X	X
0112F-2	WPF					X
0460C	WPF	30	0	100.0	X	X
0492A	SSM	50	0	100.0	X	X
0584C-1	SSM	250	30	88.0		X
0856F-2	SSM	1,200	0	100.0	X	X
0856P	WPF	170	0	100.0	X	X
0864B-3	WPF	30	0	100.0	X	X
0864B-5	SSM	5	5	0.0	X	
0868A-3	SSM	10	10	0.0	X	
0920D-1	SSM	90	0	100.0	X	X
0920D-2	SSM	135	0	100.0	X	X

X : Data supports stated BAT blowdown flow basis or recycle rate as indicated.

SSM: Strip, sheet and miscellaneous products.
WPF: Wire products and fasteners.

TABLE X-3

JUSTIFICATION OF BAT-2 AND NSPS FLOW BASIS
HOT COATING SUBCATEGORY
RINSEWATER FLOW REDUCTION SYSTEMS

Plant	Product	Applied GPT	Discharged GPT	Percent Reduction	Plant Data Demonstrates: GPT	Plant Data Demonstrates: Percent Reduction
NSPS Basis:	SSM	600	150	75.0	-	-
	WPF	2,400	600	75.0	-	-
0256G-1	SSM	107	107	0.0	X	
0256G-2	SSM	107	107	0.0	X	
0264-1	WPF	1,580	596	62.3	X	
0264-2	WPF	1,210	605	50.0	(1)	
0264-3	WPF	451	4.5	99.0	X	X
0264D-2	WPF	2,641	574	78.3	X	X
0384A-1	SSM	31.6	31.6	0.0	X	
0384A-2	SSM	21.9	21.9	0.0	X	
0384A-3	SSM	16.8	16.8	0.0	X	
0460C	WPF	1,080	5.4	99.5	X	X
0460F-1	WPF	706	141	80.0	X	X
0460F-2	WPF	627	125	80.0	X	X
0460H-1	WPF	507	507	0.0	X	
0460H-2	WPF	507	507	0.0	X	
0476A-3	SSM	56	56	0.0	X	
0640-1	WPF	529	529	0.0	X	
0728	SSM	480	0	100.0	X	X
0856N-1	SSM	112	0	100.0	X	X
0856N-2	SSM	214	0	100.0	X	X
0856N-3	SSM	218	0	100.0	X	X
0860F-1	WPF	3,130	157	95.0	X	X
0860F-2	WPF	5,760	9.6	99.8	X	X
0860F-3	WPF	5,760	6.4	99.9	X	X
0860G-1	WPF	8,182	0	100.0	X	X
0860G-2	WPF	3,025	0	100.0	X	X

TABLE X-3
JUSTIFICATION OF BAT-2 AND NSPS FLOW BASIS
HOT COATING SUBCATEGORY
RINSEWATER FLOW REDUCTION SYSTEMS
PAGE 2

					Plant Data Demonstrates:	
Plant	Product	Applied GPT	Discharged GPT	Percent Reduction	GPT	Percent Reduction
0868A-2	SSM	135	135	0.0	X	
0916A-3	SSM	120	0	100.0	X	X
0920D-1	SSM	768	64	91.7	X	X
0920D-2	SSM	120	120	0.0	X	
0920E-1	SSM	116	116	0.0	X	
0920E-2	SSM	136	136	0.0	X	
0948C-1	SSM	140	140	0.0	X	
0948C-2	SSM	92	92	0.0	X	
0920F (Terne)	SSM	301	141	53.2	X	
0384A(Al)	SSM	16	16	0.0	X	
0580G-4(Sn)	WPF	300	300	0.0	X	
0792B(Sn)	SSM	80	0	100.0	X	X
0860F-4(Al)	WPF	10,800	640(2)	94.1	X	X

---

(1) Plant exceeds limit by <1%.

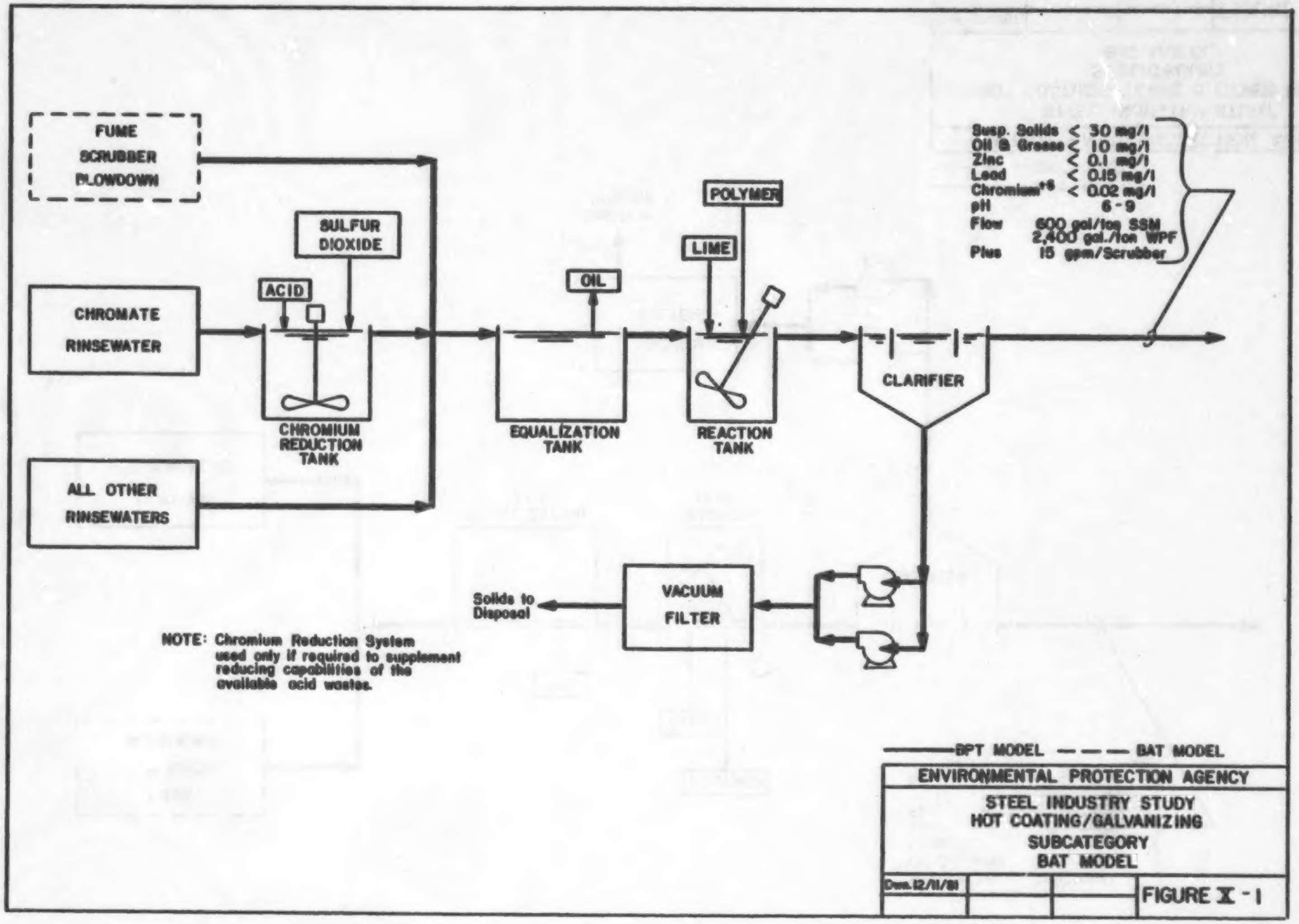
(2) Flow included scrubber blowdown. Demonstrates combined discharge flow basis of 600 GPT plus 15 GPM scrubber blowdown, equivalent to 1080 GPT for this operation.

X : Data supports stated BAT-2 and NSPS discharge flow basis or percent reduction as indicated.

SSM: Strip, sheet and miscellaneous products.

WPF: Wire products and fasteners.

( ): Coating metal shown within parentheses. All others are galvanizing lines.

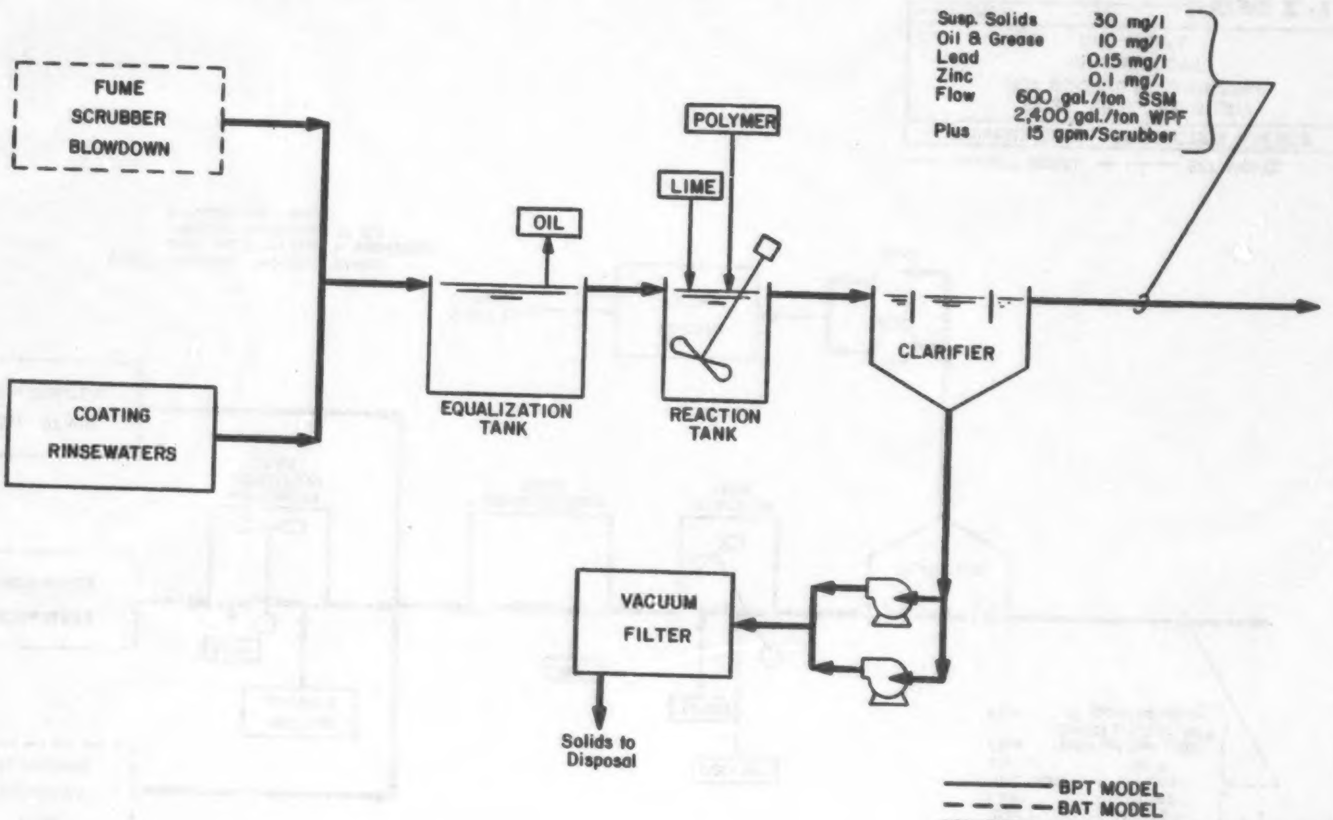

FUME
SCRUBBER
BLOWDOWN
CHROMATE
RINSEWATER
ALL OTHER
RINSEWATERS
ACID
SULFUR
DIOXIDE
CHROMIUM
REDUCTION
TANK
OIL
EQUALIZATION
TANK
LIME
POLYMER
REACTION
TANK
CLARIFIER
VACUUM
FILTER
Solids to
Disposal
Susp. Solids < 30 mg/l
Oil & Grease < 10 mg/l
Zinc < 0.1 mg/l
Lead < 0.15 mg/l
Chromium+6 < 0.02 mg/l
pH 6 - 9
Flow 600 gal/ton SSM
2,400 gal./ton WPF
Plus 15 gpm/Scrubber
BPT MODEL
BAT MODEL
Dwn. 12/11/81

NOTE: Chromium Reduction System used only if required to supplement reducing capabilities of the available acid wastes.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING/GALVANIZING
SUBCATEGORY
BAT MODEL

FIGURE X - 1


FUME SCRUBBER BLOWDOWN
COATING RINSEWATERS
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
Susp. Solids 30 mg/l
Oil & Grease 10 mg/l
Lead 0.15 mg/l
Zinc 0.1 mg/l
Flow 600 gal./ton SSM
2,400 gal./ton WPF
Plus 15 gpm/Scrubber
VACUUM FILTER
Solids to Disposal
BPT MODEL
BAT MODEL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS-TERNE & OTHER METALS
SUBCATEGORY
BAT MODEL

Dwn.12/11/81

FIGURE X-2

HOT COATING SUBCATEGORY

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

Introduction

The 1977 Amendments added Section 301(b)(2)(E) to the Act establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(a)(4) [biochemical oxygen demanding pollutants (BOD_5), total suspended solids (TSS), fecal coliform, and pH], and any additional pollutants defined by the Administrator as "conventional" (oil and grease, 44 FR 44501, July 30, 1979).

BCT is not an additional limitation, but replaces BAT for the control of conventional pollutants. In addition to other factors specified in Section 304(b)(4)(B), the Act requires that BCT limitations be assessed in light of a two part "cost-reasonableness" test. American Paper Institute v. EPA, 660 F.2d 954 (4th Cir. 1981). The first test compares the cost for private industry to reduce its conventional pollutants with the costs to publicly owned treatment works for similar levels of reduction in their discharge of these pollutants. The second test examines the cost-effectiveness of additional industrial treatment beyond BPT. EPA must find that limitations are "reasonable" under both tests before establishing them as BCT. In no case may BCT be less stringent than BPT.

EPA published its methodology for carrying out the BCT analysis on August 29, 1979 (44 FR 50732). In the case mentioned above, the Court of Appeals ordered EPA to correct data errors underlying EPA's calculation of the first test, and to apply the second cost test. (EPA had argued that a second cost test was not required).

The Agency has decided to set the BCT limitations equal to the BPT limitations for conventional pollutants for the hot coating subcategory. No additional treatment or costs beyond the BPT level is needed to comply with these limitations.

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS

Introduction

NSPS are to specify the degree of effluent reduction achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants.

For this subcategory, several plants in the industry are reported to operate with no discharge. On the basis of demonstrated performance at Plant 0856N, the Agency believes that zero discharge is achievable at some batch pipe and tube galvanizing operations. However, the technology employed at this plant may not be universally applicable to all hot coating operations. A "no discharge of pollutants" limit would only be possible for all hot coating operations through the use of advanced technologies, e.g., vapor compression distillation (BAT Alternative 3). However, this technology has not been demonstrated on wastewaters from hot coating operations.

Identification of NSPS Technology

The Agency considered four alternative treatment systems for new hot coating operations. The model flow rates, concentration basis, and the alternate NSPS are presented on Table XII-1. These alternatives are depicted in Figures VIII-1 and 2.

NSPS Alternative 1

This alternative includes all of the treatment steps included in the model BPT treatment systems and does not include flow minimization prior to treatment. Wastewaters are discharged on a once-through basis.

NSPS Alternative 2

This NSPS alternative includes flow minimizations as the initial step. The discharge of rinsewater is minimized; and where fume scrubbers are installed, the wastewaters are recycled to achieve a blowdown rate of 15 gallons/minute. The remaining steps include hexavalent chromium reduction for galvanizing operations with chromate rinses, precipitation and flocculation with lime and polymers, and clarification with vacuum filtration of clarifier underflows.

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NSPS Alternative 3

Alternative 3 includes all steps and components included in Alternative 2, with the addition of filtration. The clarifier overflow is further treated using a deep bed pressure filter.

NSPS Alternative 4

This alternative uses vapor conpression distillation to further process the effluent from NSPS 2. The wastewater is evaporated, and the condensed distillate is recycled back to the coating operation for reuse. Zero discharge is attained with this alternative.

Flow Rates

The discharge flow rates used to establish the standards are shown in Table XII-1. These flows are the same as those used to establish the alternate BAT limitations. The development and demonstration of these flows is discussed in detail in Section X. The achievability of these discharge flow rates is well demonstrated (see Table X-2 and X-3).

Effluent Quality

The same pollutants limited at BPT are also being limited for new sources, i.e., TSS, O & G, lead, zinc and hexavalent chromium. The concentration bases for the standards are the same as those used for the corresponding BPT and BAT alternative treatment systems. These concentrations are presented in Table XII-1. Discussion on the selection of the pollutants and the development of the concentration basis are set forth in Sections VI, IX and X.

Selection of NSPS

The Agency selected NSPS Alternative 2 as the NSPS model treatment system upon which the new source performance standards are based. Flow minimization of rinsewater and fume scrubber flows is practiced by several plants. Cascade rinsing, which was rejected as a model treatment technology at the BAT level due to retrofit problems, can be readily installed at new sources without problems associated with retrofitting that technology. Cascade rinsing is equally, if not more, effective in cleaning the product as conventional rinsing systems. Thus, the use of cascade rinsing will have no adverse effects on product quality and can be applied at all new hot coating lines. However, as shown by the data in Table X-3, it has been demonstrated that the reduced rinsewater flows can be achieved by methods other than cascade rinsing. NSPS Alternative 3 was not selected, since no substantial reduction (over that achieved by NSPS Alternative 2) in toxic metals discharge is achieved by filtration. NSPS Alternative 4 was rejected, since it is not demonstrated within the subcategory. The model treatment systems are illustrated in Figure XII-1 for the galvanizing operations and Figure XII-2 for terne and other coatings.

Demonstration of NSPS

The selected NSPS model flow rates are demonstrated at plants 0264, 0264D, 0460C, 0460F, 0728, 0856N, 0860F, and 0860G; and the selected model effluent quality are demonstrated at plants 0112I, 0476A, 0584F, 0612, 0856D, 0860B, and 0948C. Further discussion on the achievability of the model flow rates and effluent quality is presented in Sections IX and X.

TABLE XII-1

NSPS/PSNS EFFLUENT LIMITATIONS GUIDELINES
HOT COATING SUBCATEGORY

		Model Flow (GPT)	Unit	TSS(1)	O & G(1)	Hex.(2) Chromium	Lead	Zinc	pH(1) Units
Alternative 1:									
Concentration Basis	30-Day Avg	-		30 mg/l	10 mg/l	0.02 mg/l	0.15 mg/l	0.1 mg/l	6.0-9.0
	Daily Max	-		70 mg/l	30 mg/l	0.06 mg/l	0.45 mg/l	0.3 mg/l	
SSM-Basic Allowance	30-Day Avg	600	kg/kkg	0.0751	0.0250	0.0000501	0.000375	0.000250	6.0-9.0
	Daily Max	600	kg/kkg	0.175	0.0751	0.000150	0.00113	0.000751	
Add for Scrubber(3)	30-Day	100 GPM	kg/day	16.3	5.45	0.0109	0.0819	0.0545	6.0-9.0
	Daily Max	100 GPM	kg/day	38.1	16.3	0.0327	0.245	0.163	
WPF-Basic Allowance	30-day Avg	2400	kg/kkg	0.300	0.100	0.000200	0.00150	0.00100	6.0-9.0
	Daily Max	2400	kg/kkg	0.701	0.300	0.000601	0.00451	0.00300	
Add for Scrubber(3)	30-Day	100 GPM	kg/day	16.3	5.45	0.0109	0.0819	0.0545	6.0-9.0
	Daily Max	100 GPM	kg/day	38.1	16.3	0.0327	0.245	0.163	
Alternative 2:*									
Concentration Basis	30-Day Avg	-		30 mg/l	10 mg/l	0.02 mg/l	0.15 mg/l	0.1 mg/l	6.0-9.0
	Daily Max	-		70 mg/l	30 mg/l	0.06 mg/l	0.45 mg/l	0.3 mg/l	
SSM-Basic Allowance	30-Day Avg	150	kg/kkg	0.0188	0.00626	0.0000125	0.0000939	0.0000626	6.0-9.0
	Daily Max	150	kg/kkg	0.0438	0.0188	0.0000375	0.000282	0.000188	
Add for Scrubber(3)	30-Day	15 GPM	kg/day	2.45	0.819	0.00163	0.0123	0.00819	6.0-9.0
	Daily Max	15 GPM	kg/day	5.72	2.45	0.00490	0.0368	0.0245	
WPF-Baxic Allowance	30-Day Avg	600	kg/kkg	0.0751	0.0250	0.0000501	0.000375	0.000250	6.0-9.0
	Daily Max	600	kg/kkg	0.175	0.0751	0.000150	0.00113	0.000751	
Add for Scrubbers(3)	30-day Avg	15 GPM	kg/day	2.45	0.819	0.00163	0.0123	0.00819	6.0-9.0
	Daily Max	15 GPM	kg/day	5.72	2.45	0.00490	0.0368	0.0245	

TABLE XII-1
NSPS/PSNS EFFLUENT LIMITATIONS GUIDELINES
HOT COATING SUBCATEGORY
PAGE 2

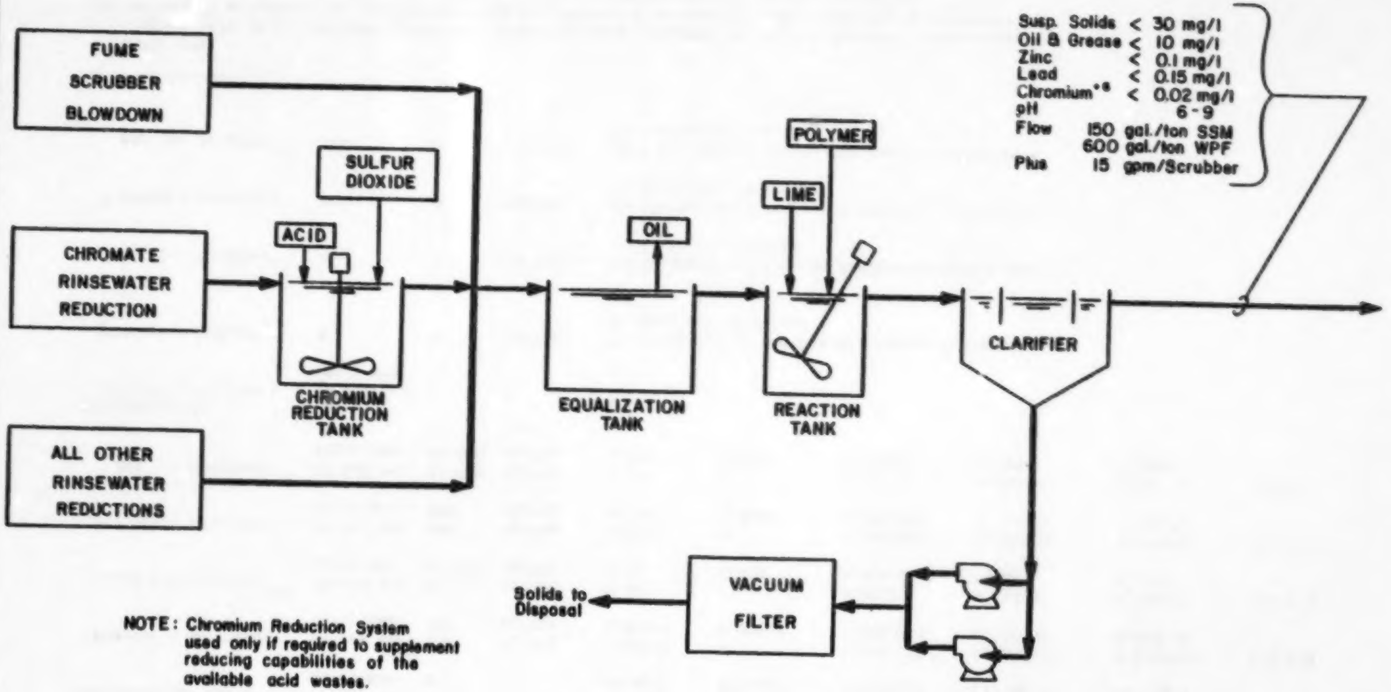
		Model Flow (GPT)	Unit	TSS[1]	O & G[1]	Hex.[2] Chromium	Lead	Zinc	pH[1] Units
Alternative 3:									
Concentration Basic	30-Day Avg	-		15 mg/l	-	0.02 mg/l	0.1 mg/l	0.1 mg/l	6.0-9.0
	Daily Max	-		40 mg/l	10 mg/l	0.06 mg/l	0.3 mg/l	0.3 mg/l	
SSM-Basic Allowance	30-Day Avg	150	kg/kkg	0.00938	-	0.0000125	0.0000626	0.0000626	6.0-9.0
	Daily Max	150	kg/kkg	0.00250	0.00626	0.0000375	0.000188	0.000188	
Add for Scrubber[3]	30-Day Avg	15 GPM	kg/day	1.23	-	0.00163	0.00819	0.00819	6.0-9.0
	Daily Max	15 GPM	kg/day	3.27	0.818	0.00490	0.0245	0.0245	
WPF-Basic Allowance	30-Day Avg	600	kg/kkg	0.0375	-	0.0000501	0.000250	0.000250	6.0-9.0
	Daily Max	600	kg/kkg	0.100	0.0250	0.000150	0.000751	0.000751	
Add for Scrubber[3]	30-Day Avg	15 GPM	kg/day	1.23	-	0.00163	0.00819	0.00819	6.0-9.0
	Daily Max	15 GPM	kg/day	3.27	0.818	0.00490	0.0245	0.0245	
Alternative 4:									
Concentration Basis	30-Day Avg	-	-	-	-	-			
	Daily Max	-	-	-	-	-			
SSM-Basic Allowance	ALL	0	kg/kkg	No discharge of Process Wastewater Pollutants to Navigable Streams					
Add for Scrubger[3]	ALL	0	kg/day	No Discharge of Process Wastewater Pollutants to Navigable Streams					
WPF-Basic Allowance	ALL	0	kg/kkg	No Discharge of Process Wastewater Pollutants to Navigable Streams					
Add for Scrubber[3]	ALL	0	kg/day	No Discharge of Process Wastewater Pollutants to Navigable Streams					

---

(1) NSPS only
(2) Applies only to galvanizing operations which discharge wastewaters from a chromate rinsing step.
(3) Additional allowance for operations using wet scrubbers to control fumes originating from coating operations. Allowance in kg/day applies to each scrubber serving coating operations.

SSM: Strip, sheet and miscellaneous products
WPF: Wire, wire product and fasteners

* : Selected NSPS/PSNS alternative


FUME SCRUBBER BLOWDOWN
CHROMATE RINSEWATER REDUCTION
ALL OTHER RINSEWATER REDUCTIONS
SULFUR DIOXIDE
ACID
CHROMIUM REDUCTION TANK
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
VACUUM FILTER
Solids to Disposal
Susp. Solids < 30 mg/l
Oil & Grease < 10 mg/l
Zinc < 0.1 mg/l
Lead < 0.15 mg/l
Chromium+6 < 0.02 mg/l
pH 6-9
Flow 150 gal./ton SSM
600 gal./ton WPF
Plus 15 gpm/Scrubber

NOTE: Chromium Reduction System used only if required to supplement reducing capabilities of the available acid wastes.

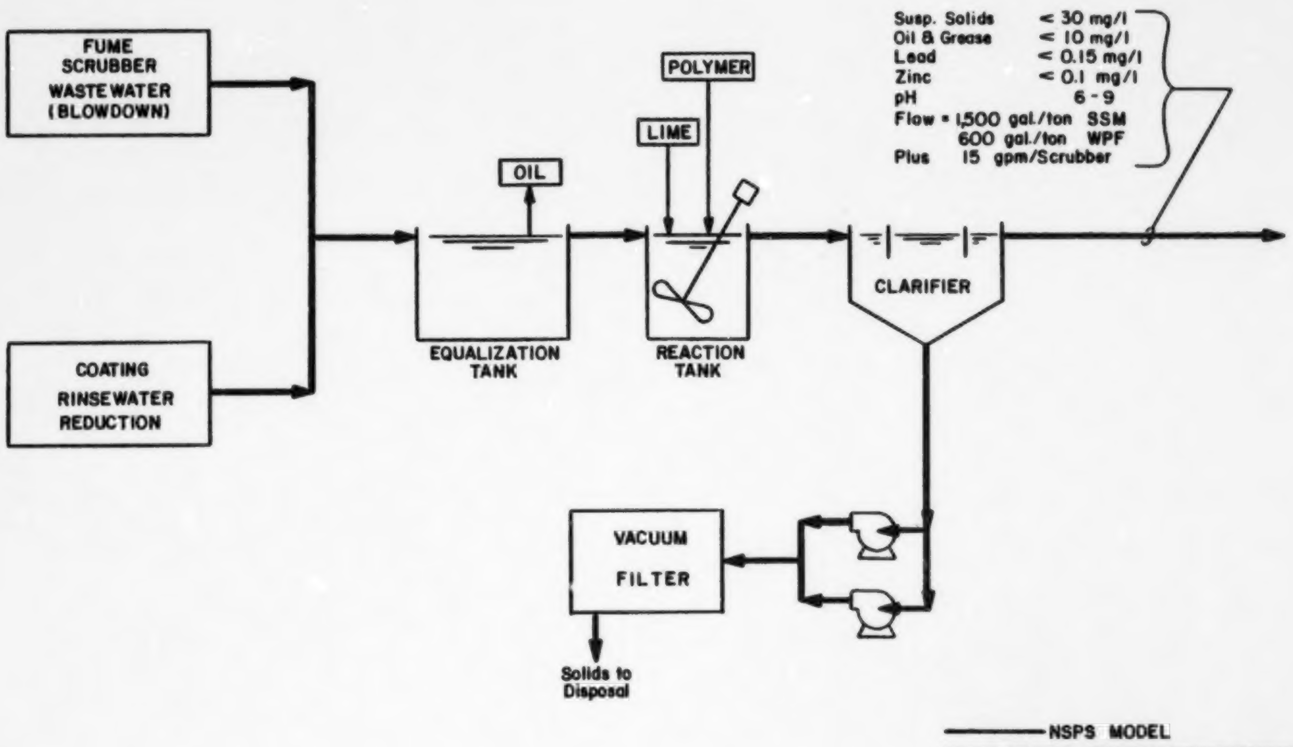
——— NSPS MODEL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING/GALVANIZING
SUBCATEGORY
NSPS MODEL

Dwn.12/11/81

FIGURE XII -1


FUME SCRUBBER WASTE WATER (BLOWDOWN)
COATING RINSEWATER REDUCTION
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
Susp. Solids < 30 mg/l
Oil & Grease < 10 mg/l
Lead < 0.15 mg/l
Zinc < 0.1 mg/l
pH 6 - 9
Flow = 1,500 gal./ton SSM
600 gal./ton WPF
Plus 15 gpm/Scrubber
VACUUM FILTER
Solids to Disposal
NSPS MODEL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS - TERNE & OTHER METALS
SUBCATEGORY
NSPS MODEL

Dwn. 12/15/81

FIGURE XII - 2

HOT COATING SUBCATEGORY

SECTION XIII

PRETREATMENT STANDARDS FOR HOT COATING PLANTS DISCHARGING TO PUBLICLY OWNED TREATMENT WORKS

Introduction

This section presents alternative pretreatment systems available for hot coating operations with discharges to publicly owned treatment works (POTWs). The Agency separately considered pretreatment of hot coating wastewaters from new sources (PSNS) and from existing sources (PSES).

General Pretreatment Standards

For detailed information on Pretreatment Standards, refer to 46 FR 9404 et seq, "General Pretreatment Regulations for Existing and New Sources of Pollution," (January 28, 1981). See also 47 FR 4518 (February 1, 1982). In particular, 40 CFR Part 403 describes national standards (prohibited discharges and categorical standards), revision of categorical standards through removal allowances, and POTW pretreatment programs.

In establishing pretreatment standards for hot coating operations, the Agency considered the objectives and requirements of the General Pretreatment Regulations. The Agency determined that uncontrolled discharges of hot coating wastewaters to POTWs would result in pass through of toxic pollutants.

Identification of Pretreatment Alternatives

Existing Sources

The model pretreatment systems for existing sources are the same as the model BPT and BCT treatment systems presented in Sections IX and X. The PSES standards associated with each alternative treatment system for all hot coating operations are set out in Table XIII-1.

PSES Alternative 1

This alternative is identical to the BPT model treatment system. The wastewaters are discharged on a once through basis. The treatment steps included chemical reduction of hexavalent chromium (for galvanizing operations with chromate rinses), lime precipitation, flocculation with polymers, and clarification with vacuum filtration of underflows.

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PSES Alternative 2

Alternative 2 includes the same treatment steps as Alternative 1, except that the fume scrubber flow to the treatment system is reduced to 15 gpm by recycle. The rinsewaters continue to be discharged on a once-through basis.

PSES Alternative 3

This alternative is the same as Alternative No. 2, except that additional flow reduction and treatment is included. Rinsewaters are reduced by the use of cascade rinsing, further reducing the overall discharge of wastewaters. In addition the effluent from the clarifier is further treated using pressure filters.

PSES Alternative 4

This alternative achieves zero discharge through the use of vapor compression distillation.

New Sources

The alternative pretreatment systems for new sources are identical to the NSPS alternative treatment systems presented in Section XII.

PSNS Alternative 1

This alternative includes all of the treatment steps included in the model BPT treatment system, and does not include any flow minimization. Wastewaters are discharged on a once-through basis.

PSNS Alternative 2

This alternative includes flow minimization through the use of cascade rinsing and recycle of fume scrubber wastewaters. The treatment steps include reduction of hexavalent chromium, lime precipitation, flocculation using polymers, and clarification with vacuum filtration of the clarifier underflow.

PSNS Alternative 3

In this alternative, the effluent from Alternative 1 is further treated by filtration. The clarified effluent is treated using pressure filters.

PSNS Alternative 4

This alternative achieves zero discharge through the use of vapor compression distillation.

Selection of Pretreatment Alternatives

The Agency selected PSES Alternative 2 and PSNS Alternative 2 as the bases for the promulgated PSES and PSNS, respectively. These alternatives are the same as the BAT and NSPS model treatment systems. These alternatives provide for substantial removal of toxic metals without the high cost of evaporative technologies. Filtration, as included in PSES Alternative 3 and PSNS Alternative 3, provides only marginal incremental toxic metals removal. A comparison of the removal rates of toxic metals from untreated hot coating wastewaters for the selected pretreatment alternatives to POTW removal rates for these metals follows:

	PSES Alternative 2	PSNS Alternative 2	POTW
Chromium (hexavalent)	95-99%	96-99%	0%
Lead	83-95%	87-98%	48%
Zinc	80-99%	97-99.9%	65%

As shown above, the selected PSES and PSNS alternatives will prevent pass through of toxic metals at POTWs to a significantly greater degree than would occur if hot coating wastewaters were discharged untreated to POTWs and are the same as the BAT and NSPS model treatment systems, respectively. The selected pretreatment alternatives are illustrated in Figure XIII-1 and the PSES and PSNS are presented in Table XIII-1 under the headings PSES Alternative 2 and PSNS Alternative 2, respectively. The achievability of these standards is addressed in Sections IX, X, and XII.

TABLE XIII-1

PSES EFFLUENT LIMITATIONS GUIDELINES
HOT COATING SUBCATEGORY

		Model Flow (GPT)	Unit	Hex.$^{(1)}$ Chromium	Lead	Zinc
Alternative 1:						
Concentration Basis	30-Day Avg	-		0.02 mg/l	0.15 mg/l	0.1 mg/l
	Daily Max	-		0.06 mg/l	0.45 mg/l	0.3 mg/l
SSM-Basic Allowance	30-Day Avg	600	kg/kkg	0.0000501	0.000375	0.000250
	Daily Max	600	kg/kkg	0.000150	0.00113	0.000751
Add for Scrubber$^{(2)}$	30-Day Avg	100 GPM	kg/day	0.0109	0.0819	0.0545
	Daily Max	100 GPM	kg/day	0.0327	0.245	0.163
WPF-Basic Allowance	30-Day Avg	2400	kg/kkg	0.000200	0.00150	0.00100
	Daily Max	2400	kg/kkg	0.000601	0.00451	0.00300
Add for Scrubber$^{(2)}$	30-Day Avg	100 GPM	kg/day	0.0109	0.0819	0.0545
	Daily Max	100 GPM	kg/day	0.0327	0.245	0.163
Alternative 2:*						
Concentration Basis	30-Day Avg	-		0.02 mg/l	0.15 mg/l	0.1 mg/l
	Daily Max	-		0.06 mg/l	0.45 mg/l	0.3 mg/l
SSM-Basic Allowance	30-Day Avg	600	kg/kkg	0.0000501	0.000375	0.000250
	Daily Max	600	kg/kkg	0.000150	0.00113	0.000751
Add for Scrubber$^{(2)}$	30-Day Avg	15 GPM	kg/day	0.00163	0.0123	0.00819
	Daily Max	15 GPM	kg/day	0.00490	0.0368	0.0245
WPF-Basic Allowance	30-Day Avg	2400	kg/kkg	0.000200	0.00150	0.00100
	Daily Max	2400	kg/kkg	0.000601	0.00451	0.00300
Add for Scrubber$^{(2)}$	30-Day Avg	15 GPM	kg/day	0.00163	0.0123	0.00819
	Daily Max	15 GPM	kg/day	0.00490	0.0368	0.0245

TABLE XIII-1
PSES EFFLUENT LIMITATIONS GUIDELINES
HOT COATING SUBCATEGORY
PAGE 2

		Model Flow (GPT)	Unit	Hex.(1) Chromium	Lead	Zinc
Alternative 3:						
Concentration Basis	30-Day Avg	-		0.02 mg/l	0.1 mg/l	0.1 mg/l
	Daily Max	-		0.06 mg/l	0.3 mg/l	0.3 mg/l
SSM-Basic Allowance	30-Day Avg	150	kg/kkg	0.0000125	0.0000626	0.0000626
	Daily Max	150	kg/kkg	0.0000375	0.000188	0.000188
Add for Scrubber(2)	30-Day Avg	15 GPM	kg/day	0.00163	0.00819	0.00819
	Daily Max	15 GPM	kg/day	0.00490	0.0245	0.0245
WPF-Basic Allowance	30-Day Avg	600 GPM	kg/kkg	0.0000501	0.000250	0.000250
	Daily Max	600 GPM	kg/kkg	0.000150	0.000751	0.000751
Add for Scrubber(2)	30-Day Avg	15 GPM	kg/day	0.00163	0.00819	0.00819
	Daily Max	15 GPM	kg/day	0.00490	0.0245	0.0245
Alternative 4:						
Concentration Basis	30-Day Avg	-	-	-	-	-
	Daily Max	-	-	-	-	-
SSM-Basic Allowance	ALL	0	kg/kkg	No discharge of Process Wastewater Pollutants to Navigable Streams		
Add for Scrubger(2)	ALL	0	kg/day	No Discharge of Process Wastewater Pollutants to Navigable Streams		
WPF-Basic Allowance	ALL	0	kg/kkg	No Discharge of Process Wastewater Pollutants to Navigable Streams		
Add for Scrubber(2)	ALL	0	kg/day	No Discharge of Process Wastewater Pollutants to Navigable Streams		

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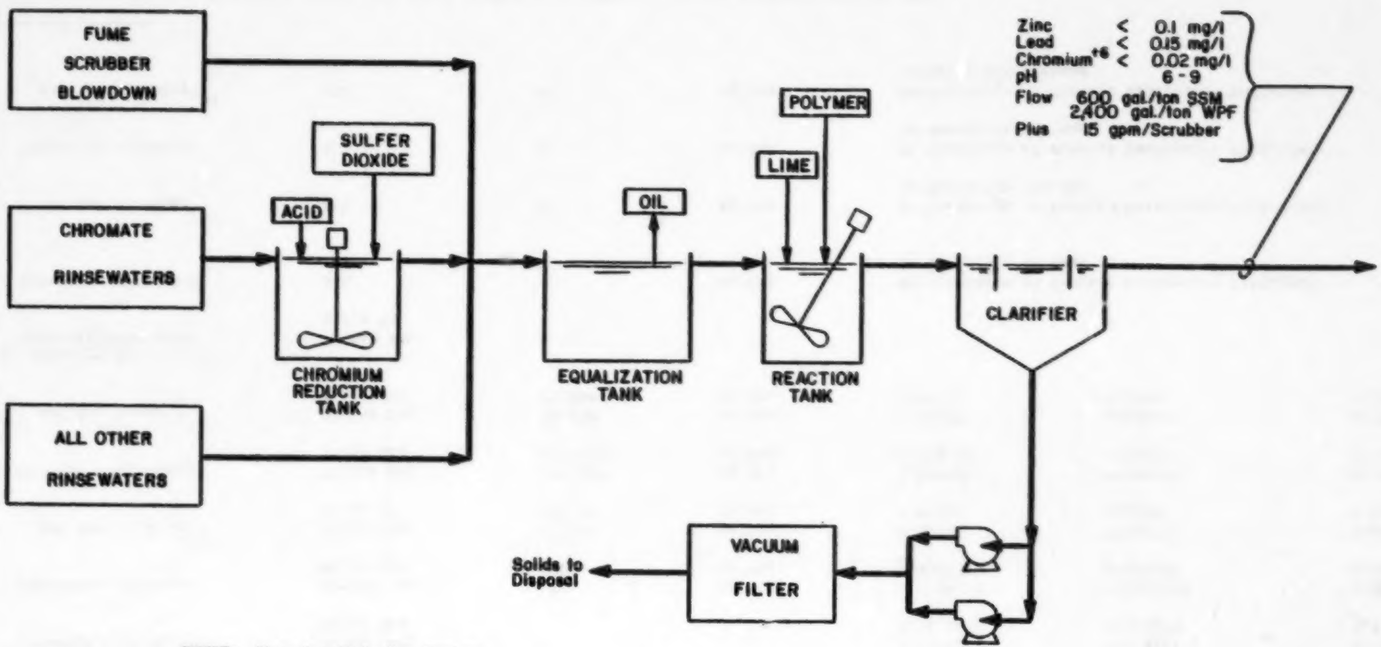
(1) Applies only to galvanizing operations which discharge wastewaters from a chromate rinsing step.
(2) Additional allowance for operations using wet scrubbers to control fumes originating from coating operations. Allowance in kg/day applies to each scrubber serving coating operations.

SSM: Strip, sheet and miscellaneous products
WPF: Wire, wire product and fasteners

* : Selected PSES alternative


FUME
SCRUBBER
BLOWDOWN
CHROMATE
RINSEWATERS
ALL OTHER
RINSEWATERS
SULFER DIOXIDE
ACID
CHROMIUM REDUCTION TANK
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
Zinc < 0.1 mg/l
Lead < 0.15 mg/l
Chromium+6 < 0.02 mg/l
pH 6 - 9
Flow 600 gal./ton SSM
2,400 gal./ton WPF
Plus 15 gpm/Scrubber
VACUUM
FILTER
Solids to Disposal

NOTE: Chromium Reduction System used only if required to supplement reducing capabilities of the available acid wastes.

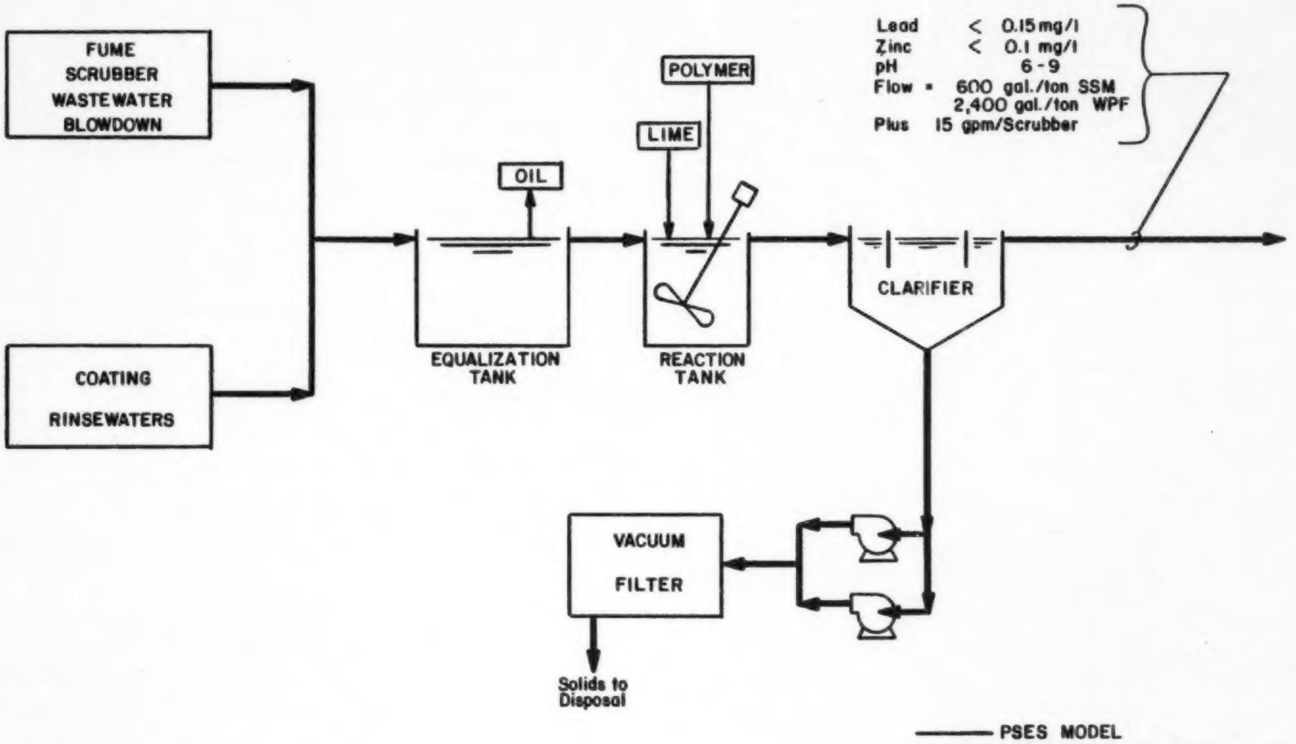
—— PSES MODEL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING/GALVANIZING
SUBCATEGORY
PSES MODEL

Dwn. 12/15/81

FIGURE XIII - 1


FUME
SCRUBBER
WASTEWATER
BLOWDOWN
COATING
RINSEWATERS
OIL
EQUALIZATION TANK
LIME
POLYMER
REACTION TANK
CLARIFIER
Lead < 0.15mg/l
Zinc < 0.1 mg/l
pH 6-9
Flow = 600 gal./ton SSM
2,400 gal./ton WPF
Plus 15 gpm/Scrubber
VACUUM
FILTER
Solids to Disposal
PSES MODEL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS-TERNE & OTHER METALS
SUBCATEGORY
PSES MODEL

Dwn. 12/15/81

FIGURE XIII-2

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